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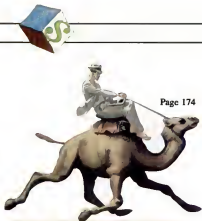
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**Protect  
Your Investment  
In Hardware  
And The**

**Integrity Of Your Data With A Qubie' Standby Power System**

# Keep 'Em Going

Your local power company is not equipped to provide the filtered, constant power your micro needs for dependable operation. That's why you need a steady flow of clean, regulated power provided by the SB200 or XT300 Standby Power System. They will protect the delicate circuitry in your PC from damage caused by brown-outs, black-outs, surges, spikes, and electromagnetic interference (EMI).

## No Snow

Most of us are vaguely aware of the need for protection from power disturbances. Everyday ordinary appliances like electric drills or vacuum cleaners add EMI to the line. It's what causes the snow on your TV picture, the buzz on your radio, and makes your computer make unexplainable errors. Special circuitry filters out these line disturbances. The SB200 and XT300 provides about double the noise filtering of competing products.

## Long Life Protection

The typical filtering device does supply some protection against surges. Most of these use a component called a metal oxide varistor (MOV). MOV's are inexpensive, and they work fine for awhile. The bad news is each time an MOV absorbs a surge, its usefulness is diminished. After awhile, MOV's are just like an expired insurance policy—they look like protection, but don't try to collect. The SB200 uses an avalanche diode for fast reaction to small surges,

(just .1 nanoseconds) and a gas discharge tube for longer surges at higher voltages. Unlike varistors, these two devices do not lose effectiveness with use, and can shield your computer from up to 1,000,000 watts of power!

## "Lights Out"

What about the other side of the coin. Like a momentary drop or even a blackout of power? We've all seen the lights suddenly dim or brighten as a copy machine, arc welder, or air conditioner turned on or off. Or those hot summer days when the power company lowers the line voltage. Reduced voltage causes your PC's electronics to overheat, decreasing their life up to 50%. Plain old surge protectors are helpless. Your data gets scrambled and you don't have a clue why.

**Bell Labs monitored the power at 24 computer sites of the Bell operating companies and found that 87% of power problems were voltage sags!**

You need a source of standby power that can step in and keep your PC going when the power company lets you down. The SB200 has its own battery which comes on-line as soon as voltage drops below 108 volts. With just 4 to 10 milliseconds notice it will keep your PC going as if nothing happened. The XT300 provides a faster response time (1 to 4 milli-

seconds), and a larger battery capable of 300 watts of output. The faster response time is required by some computers with sensitive power supplies like the IBM PC/XT. A red indicator light and alarm buzzer warn you that your PC is now running on back-up power. You now have time to complete any job you are performing, save your work to disk, and power down your system.

**Without standby power you could lose hours of work, or worse yet, have precious data damaged without you knowing it!**

## The Qubie' Acid Test

When you buy from Qubie' you get back-up on your purchase. Start with a one year parts and labor warranty. We perform all repairs within 48 hours or we replace the item. You get the protection of the Qubie' Acid Test. We guarantee your satisfaction for thirty days from purchase or we give you a complete refund including the cost of the freight to return the item.

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SB200 \$329, XT300 \$429. Includes UPS surface freight, and insurance. Add \$15 for two day air service. For fastest delivery send certified check or credit card. Personal checks take 18 days to clear. Calif. residents add 6% sales tax. Corporations & Institutions call for purchase order details.

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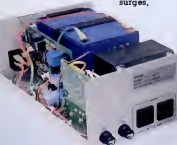
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# What's Inside

Squinting to relieve sore eyes and stretching to ease a nagging back pain, a PC editor gets the story on how public relations sometimes evolves into PC News.

**T**his morning about 9:10 or so, I wandered into my office to cheerfully begin my day's labor. My computer, which is too wide to fit comfortably on the part of the desk normally reserved for the typewriter, was perched on several copies of *PC Magazine* and swayed precariously as I hit the On switch. The printer, which is set next to the computer, chattered away with enough noise to wake even a New York subway train conductor, and as it spit out each page, the paper spilled messily onto the floor. The fluorescent overhead lights played on the computer screen like a psychedelic light show, which might have been rather enjoyable if I wasn't trying to read the bright red figures coming up on the screen (apparently some smart alec was playing with the color programming last night).

As I sifted through the mounds of paper on my desk and shifted my weight slightly to ease the back pain caused by my 10-year-old swivel chair, I came across a note that said, "We are doing an issue on ergonomics. What the heck is that?"

Ergonomics (occasionally referred to as biotechnology) is defined in *Webster's New Collegiate Dictionary* as "the aspect of technology concerned with the application of biological and engineering data to problems relating to man and the



machine." In other words, how do you fix an office so that your back doesn't ache, your eyes aren't strained, your printer doesn't drive you to earplugs, and your desk is equipped to support the technology that you are working with?

You can find some answers to these questions in this issue. Winn Rosch explains how keyboards can affect your use of a microcomputer, John Dickinson eyes the problem with screens, and Scott Kariya finds the right chair for the job. Then Bill Howard profiles a New Hampshire company that makes products to fill the ergonomic gap left by IBM in its original PC design, and Martin Porter reports on his field trip to the IBM Human Fac-

tors Lab, where seven engineers test IBM machines to come up with designs that are most comfortable for users. We have also assembled some photographs of ideal microcomputer workstations, which you can, if you feel the need, tear out of the magazine and present at the next meeting of the Office Planners' Committee. I know I will.

## The PC News Story

The other day, I felt a distinct twinge of guilt when I realized that this column has been primarily concerned with the doings of the features department of *PC*. In order to balance the situation, I pulled assistant editor James Langdell into my office, pushed him into a chair, and demanded that he tell me about PC News.

James, who migrated to New York from sunny California, has a reputation among the staff as being the most laid-back person this side of the Hudson River. Sitting back in the chair and fixing his eyes on some far-off and unknown horizon, he calmly began.

"The 12 pages of PC News are the last ones to go into *PC Magazine*, since there must be time to pack in coverage of the very latest news event."

Suppose James gets a phone call from Veeblesmeyer and Smetzer, a well-known New York public relations firm. The firm is calling on behalf of

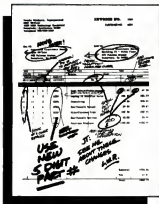
## WHAT'S INSIDE

ScrungleTec, a large hardware corporation that has just produced the newest in floppy disk scrungers.

"They're usually calling to find out if

we're coming to the press conference," James reported. "And there are always half a dozen other press conferences on that same day."

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CIRCLE 470 ON READER SERVICE CARD

The day of the chosen press conference usually arrives the day before the article has to be in. It's usually in some high-class New York City hotel, with silver platters, cloth napkins, and whatever cuisine happens to be "in" that week.

Finally, the actual product is introduced. Somewhere in the course of all the introduction and elaborate speeches that follow, the reporters must try to find out who this product is meant for, what it does, and—this is often the hardest thing to discover—how much it costs. "But the most mysterious issue of all," Langdell whispered, is "when will it *really* be available."

The attendees are then presented with their souvenir: a glorified notebook that contains a ream of press releases with the life histories of all the company executives and press clippings of favorable reviews that other publications wrote about the company's last product.

The intrepid reporter returns to the office. Then comes the hard part: trying to figure out if the scrunker is different from all the other scrungers that are already on the market, and if so, how.

Next come questions about the product itself. Does the scrunger work on double-density, double-sided disk drives without destroying the drive's DIP switch? And what about hard disk drives? Or tape backup? And of course, when deadline permits, it's always best to get a hands-on version for some quick and thorough testing. "We'd try to scrunge a few disks," said James with some relish, "and perhaps try to scrunge them backwards as well. . . ."

Once the process is over, the article can be written (usually, in the half an hour remaining before the deadline hits).

In this fashion (well, perhaps not always in this fashion), our PC News department (headed by executive editor Connie Winkler and abetted by assistant editor Virginia Dudek and editorial assistant Jane Mintzer) will always deliver the latest and greatest happenings from the computer universe. ■

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# TWENTY-SIX REASONS YOU SHOULD BUY A DIABLO PRINTER

## Diablo

### Reason 1: Diablo Leads The Industry

Diablo is a clear leader in the printer industry, the one brand all others compare to. Why go with any less than the original?

### Reason 2: Clearly Superior Quality

Ask our customers. Datamation magazine does. In the most respected annual brand preference survey. And year after year their survey has shown Diablo daisy-wheel printers voted number one — by end users and OEM's alike.



### Reasons 3-15: The Most Extensive Product Line

Diablo offers 13 different printers, from daisywheel to matrix to electronic, for every business purpose.

for every business computer. No other manufacturer offers as many.

### Reason 16: Real Compatibility

Our universal interface for personal computers means that any of Diablo's API printers plays with every major brand of personal computer. Including IBM's.

### Reason 17: Reliability

Compare Diablo printers to the competition. Our printers run longer between servicing than the others, model for model, across the board.

### Reason 18: Over 1200 Diablo Dealers

Diablo printer products are available throughout the US and Canada at over 1200 locations.

### Reason 19: Genuine Diablo Supplies and Accessories

Diablo doesn't even stop there. We offer over 300 printwheels.



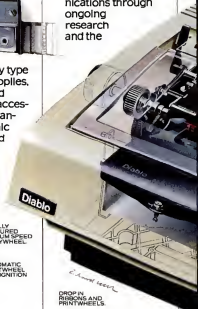
ribbons for every type of printer. Ink supplies, cleaning kits, and paper handling accessories like mechanical and electronic sheet feeders and forms tractors. Diablo has everything you need for computer printing.

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### Reason 20: Xerox, Our Parent

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creative application of technology to everyday business life worldwide. And we will continue this endeavor as long as there are discoveries to be made.

**Reason 21: Service for All Diablo Products**

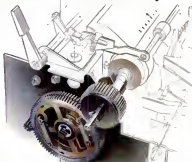
The worldwide network of Xerox and Diablo service centers stands ready to provide fast and economical service. Couple this with the technical and service hotlines and you've got a complete support network.

**Reason 22: Nothing But Printer Products**  
Diablo makes printer products and nothing else. We make no compromise between printers and other system products. Other printer companies do.

**Reason 23: We Make Printers Easy**

All of our printers are easy to set up and easy to operate. They were designed that way, because they're supposed to be used, not fussed over.

**Reason 24: Tradition of Innovation**  
We're the leader in innovation. We always have been. Diablo invented the daisy-



wheel in 1972 and we've never looked back. We're constantly refining our products and looking for new ways to improve

the technology. That's why we're the only printer company that offers the variety of printers and technologies that we do. We simply don't believe in resting on laurels.

**Reason 25: IBM®**  
IBM micros are here to stay. And so is Diablo. That's why we have developed such a complete line of IBM compatible printers. Whether daisywheel, matrix or color; correspondence or graphics, dedicated or API, Diablo's "IBM compatible" printers are just that.

**Reason 26: Because You Just Can't Buy A Better Printer**

No other printer company can say what we've said here. Nobody. And when you consider the importance of the investment you make in business equipment why would you settle for anything less?



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# TOUCHSTONE 1



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While everyone else is jumping all over the place hunting for numbers one digit at a time, you'll be breezing along, entering whole strings of numbers without even looking...at your TOUCHSTONE 1™ rapid data controller.

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...Touchstone 1 was designed to be a productivity tool for people who enter and revise numeric data...in spreadsheets, accounting systems, inventory control and similar applications. Touchstone means quick answers to important business questions.

### The right keys...right at your fingertips...right now

Imagine...\$, %, and ( ) for compound math formulas—without shifting. Separate cursor keys and efficient numeric layout let you forget the NUMLOCK ever existed. The Touchstone 1 has its own enter key, as well as backspace, space, home, period, comma, slash and equals; plus add, subtract, multiply and divide.

### Reliable performance

The Touchstone 1 has its own unique microprocessor with 16-character buffer and patented Error Elimination system. Every rollover ensures positive

entry of every keystroke, even when a previous key has not been fully released.

Quiet full-travel keyswitches are rated for 50 million cycles; contacts are covered by a protective membrane to guard against dirt, dust and accidental spills.

Touchstone 1: Built so well it carries a full, one-year warranty, plus a 15-day money-back guarantee.

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Low-profile design meets DIN space; reduces fatigue and back, neck and eye strain. Heavy-duty case is easily lap-portable, but won't slide around. Standard locating pin on 5 key, helps keep fingers where they belong.



### Enter numbers twice as fast

Touchstone 1 data entry takes about 40% of the movement required with the standard PC keyboard. Even more important, you don't have to take the time to look for each digit.

An example; the formula:

$$((43816 \times 12) + (52 \times 147.3) / (47/12))$$

Using the standard PC keyboard

(forgot the PC number pad unless you can cope with the NUMLOCK), this formula takes 37 keystrokes including 6 shifts, and hand movement totalling 137 inches. With the Touchstone 1 keyed, the same formula is entered with 31 strokes, including NO shifts, and total hand movement of just 57 inches.

### A plug-compatible workmate for the IBM PC and XT

Split cable and standard connectors allow you to use the Touchstone 1 alone or side-by-side with the main keyboard. When used together, any key can be entered from either keyboard anytime.

### An investment in greater efficiency

Until now, numeric data entry has been the most tedious part of PC operation. If you have better things to do with your time, you really should consider investing in a Touchstone. Only \$189.95. Order by mail or phone for immediate shipment, or ask for it at leading computer stores.

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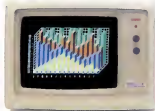
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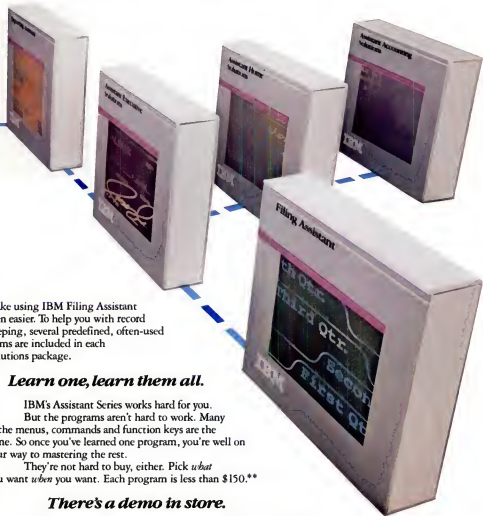
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# IBM News

FROM THE EDITORS OF PC

OCTOBER 2, 1984

## IBM's Awesome AT Rocks Industry

IBM's long-awaited 80286 machine boasts two 20-megabyte hard disks, XENIX and DOS, 2.5 megs RAM, and 'corrected' Selectric keyboard

BY BILL MACHRONE AND PAUL SOMERSON

NEW YORK—Advanced Technology. That's what the "AT" means in IBM's new PC AT. The long-awaited machine uses Intel's 80286 processor, runs DOS 3.0, and has a host of powerful add-ins that make this desktop data-cruncher a machine to be reckoned with.

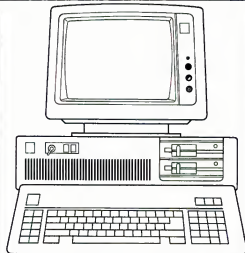
Other new hardware and software enhancements, such as a high-resolution color board that replaces IBM's current underpowered model, and a windowing program, are expected shortly.

The outside looks familiar, more like a TI Professional or a Compaq Deskpro than the traditional slope-nosed PC, but that's where the similarity ends. The front panel sports a cylindrical key lock, along with indicators for power-on and disk drive ready. The power switch remains in the traditional right rear corner. You can turn the power on, but you need the key to actually use the PC AT.

### Inside Story

There's plenty to rave about inside PC AT, which IBM dropped on the industry on the third birthday of the PC.

The motherboard is the first and most obvious change. The



AT's eight expansion slots are positioned where you would expect to find them, but six of them have an additional socket immediately in front of the familiar one. The additional socket provides a full 16-bit data path to the machine's memory. Both the on-board memory and the expansion memory can be addressed 16 bits at a time, increasing throughput over the 8-bit PCs. The main memory ac-

commodates the PC-standard 640K, while expansion memory can be increased in 512K increments to a maximum of 2.5 megabytes!

The machine combines half-height floppy drives and half-height hard disks (one of which comes standard with the machine) for a maximum configuration of one "high-density" floppy and two hard disks or two floppies and one hard disk. The

A: drive must be one of the new high-density floppies, essentially the 96-track-per-inch technology already successfully used by Tandy and others. The B: drive can be a high-density or a standard 48-tpi drive, or an additional hard disk. The PC AT comes with all the cabling and connections for adding its full complement of drives, so it is easy to expand the system.

The standard hard disk formats to 20 megabytes, and other sizes will be available. Both the hard disks and the floppies are driven by a single controller card. Like the memory expansion boards, the controller plugs into the 16-bit bus, an essential feature for direct-memory transfers (DMA) to any part of the machine's enormous memory.

The disk controller board is the only one other than the memory cards to offer full 16-bit addressing. However, IBM will offer a prototyping card that plugs into both sockets, enabling third-party developers and systems integrators to tap into the machine's full power.

A casual perusal of the AT's motherboard reveals a higher level of integration than that of the old PC. There are noticeably

(continued)



**Awesome AT** (continued)

fewer support chips and there is ample room between them. IBM could have designed serial and parallel I/O ports onto the board, as many of the compatibles manufacturers have. Instead, there is a new expansion card, with both a serial port and a parallel port. There is a socket on the motherboard for an 8087 math chip. Evidently, IBM couldn't count on the availability of the 80287 chip, so it used the older design.

**Operating Systems**

The PC AT has DOS 3.0. The differences from previous versions won't jump out and grab you by the throat, but they're there.

For starters, the disk formatting program now recognizes three specific operating systems: DOS, PC/IX, and XENIX. People expected this machine to multitask, and although DOS 3.0 is not a multitasking (or multi-user) operating system, XENIX is.

There have been some impressive multi-user implementations of XENIX on unadorned PC-XTs, so the PC ATs should be noticeably better. PC/IX is, for the moment, a single-user operating system, but this machine will be a good engine for dedicated, memory-intensive applications.

The keyboard has been revamped to more closely resemble IBM's much loved Selectric, although it still sports the same 10-key function pad on the left and a new number/cursor pad on the right. The Enter key now comes in the familiar Selectric large J-shape, and the shift keys have been returned to their original typewriter positions.

DOS 3.0 provides file sharing and a form of network support. New commands such as SHARE and ATTRIB control file access by multiple processes, and it appears that DOS now provides at least some background arbitration of file contention.

The PC AT is a formidable machine that should keep IBM squarely atop the microcomputer world and send shudders through the ebbing compatibles industry. ■

# PCjr Grows Up (Finally), And Goes off to School

In Junior's schoolbag is a reasonable keyboard, a fun \$99 paint cartridge, education packages, and something for mom and dad, too

BY CONNIE WINKLER

NEW YORK—IBM's troubled PCjr has been born again. Whether it's been saved, however, is a question still being answered. In the latest round of PCjr enhancements, IBM gave the PCjr:

- A new, improved wide-top, full-travel keyboard that resembles a miniature Selectric typewriter and has a 2-ounce touch. Like the original, this keyboard is also from Advanced Input Devices, in Idaho. Moreover, IBM offered to replace at no cost the clumsy Chiclet keyboard that came with the initial system—but only to users who purchased their systems from an authorized IBM dealer.

- A 128K, IBM-designed and -manufactured memory expansion attachment for \$325. It attaches to the PCjr side, with all or part of it functioning as a virtual memory (RAMdisk) diskette. With the addition of another new IBM product, a power expansion unit, a number of expansion modules can be daisy-chained up to 640K. IBM retained the system unit that initially came with 128K.

- A highly competitive price tag: \$999 for the one disk drive unit—it was \$1,269 at the November 1983 announcement, but has been highly discounted since—or \$1,324 with the 128K memory enhancement. The latest color monitor announced for the PCjr is \$429.

"That's the best bargain in town," says Philip D. Estridge, vice president of the PC division, at the PCjr revival announcement on July 31.

What's more, in connection with the *Writing to Read* language laboratory for school systems, IBM threw in the color monitor and cut the price to

\$950 (see related story).

- A \$300 speech synthesizer contains a 196-word vocabulary of its own and lets users record and store their speech on a disk for later playback.

- A slick \$99 graphic-design cartridge with mouse-control, pull-down menus, and other state of the art, such as PCjr

initially. "I think potential purchasers will sort that out."

The PCjr already had sound capabilities superior to the PC, but now the \$300 IBM PCjr Speech Attachment will encode speech in a compressed mode. The speech synthesizer uses Linear Predictive Coding (LPC) and Continuously Variable



*ColorPaint*, so that with a Microsoft or Mouse Systems mouse, the user can draw and paint in color. "It's just like Apple's Macintosh," whispers a PCjr fan, "except the PCjr runs in 16 colors and the Macintosh runs in Mac monochrome."

In addition, IBM announced that Lotus Development Corp.'s popular 1-2-3 spreadsheet would be available on PCjr cartridges.

**Second Try**

"The PCjr is now about what it should have been in the first place," comments one PC industry observer. Many insiders seemed most impressed that IBM admitted its mistake on the PCjr keyboard and offered its new keyboard free to current owners. New PCjrs will automatically come with the full-travel, 62-key keyboard.

Will this enhanced PCjr cannibalize sales of the PC? "If that happens, it's ok," says Estridge, the man who pulled off the PC

Slope Delta (CVSD) modulation techniques to support speech and sound. Users can either enter voice commands through their own microphones or through cartridges manufactured with prerecorded speech or sounds.

A combo disk-cartridge financial-planning package, *Andrew Tobias Managing Your Money*, is available for the PCjr, IBM announced. The \$199 package of two diskettes and a cartridge covers everything you wanted to know about managing money.

The PCjr *ColorPaint* is sure to attract users, especially at the bargain price. Requiring 128K and a mouse (from Mouse Systems, Inc., or Microsoft), *ColorPaint* allows users to draw objects and paint in different brush styles and patterns—and in 16 colors. Unlike the other PCjr products, which were ready the day after the announcement, *ColorPaint* was not available until September. ■



# Is jr 'Likely to Succeed'? Friends Gloat, Foes Groan

'IBM's back to doing things the right way,' says optimistic dealer

BY VIRGINIA DUDEK

NEW YORK—Not everyone agrees on what the future holds for the IBM PCjr. The reaction of computer dealers to the upgraded PCjr appears optimistic and enthusiastic, while the response from computer analysts ranges from skeptical to unimpressed.

"I'm cautiously optimistic," says Mark Boots, vice president of operations at Computer Solutions, a retail chain based in Oklahoma City. "IBM's back to doing things the right way. At least now we have the tools to go back and give it our best shot."

"I think IBM has made the product much more viable," says Ed Ramos, president of Future Information Systems, Inc., of New York, "especially as a light workstation from a business standpoint, and at home." He thinks the PCjr can now draw more people with computer experience at work into the home computer market because it can run more business-oriented software. However, from a dealer's standpoint, Ramos feels IBM "needs to instill more enthusiasm into the sales force to remove the negative feelings developed over the last 6 months."

## Sales Concerns

"Basically, IBM addressed the product-related issues," says Paul Matteucci, an analyst in the home computer group at Future Computing in Richardson, Texas. "Next, it needs to deal with the marketing, merchandising, and distribution issues." Matteucci feels this has been overlooked because the PC is shipped through the same channels as the PCjr. "Most of the salespeople focus on office users and not home users. IBM needs more merchandising to position the PCjr as a high-end



computer."

Matteucci also feels that IBM made the PCjr what the IBM PC was a year ago. "The additions made it a dual-purpose machine. On the one hand, it's most of what used to be the entry-level PC. On the other hand, the enhancements make it good for software manufacturers and it has better graphics."

Michelle Preston, senior vice

president of L.F. Rothschild, Unterberg, Towbin in New York, feels IBM hasn't answered the product positioning conflict of the PCjr. "It seems to have three different markets," she says, "the upper-end home market, the educational market, and the work-at-home market. In order to reach the home market, IBM will first have to overcome the stigma of the PCjr as a

failed product." She also feels the educational market for PCjr is limited for now because it addresses only kindergarten and first grade.

Preston is also interested in the effect the modifications will have on the IBM PC. "This means IBM will have to reposition the PC," she says. She also expects some IBM compatibles to be hurt, especially those sold on a price basis.

## Where's the Niche?

Other market analysts have difficulty with the idea of a home computer produced by IBM. "By enhancing the PCjr, IBM has turned 180 degrees and is going for the professional market rather than the person in the home," says John Rutledge, senior securities analyst at Becker, Paribas in New York. He feels the home market has not been defined yet and that "IBM is trying to play all the bases" with the PCjr.

"I was shocked" at the modifications, says Lisa Romeo, research assistant at Becker, Paribas. "I think IBM made the PC obsolete," she continues. "The only thing separating the new jr from a PC is a hard disk."

Some observers are more supportive of IBM's plans for the PCjr. "I always believed IBM was going to put the PCjr back on schedule," says Eri Golembo, vice president of marketing at Prodigy Computer Systems, a retail firm in New Jersey. "There is now a clear migration path from the PCjr to the PC."

Golembo feels the changes will have a minimal impact on PC sales, because "the idea of a PCjr is to start off low and build up gradually. It will revitalize the low-end home market to have a low-cost product handled by IBM."

"IBM is showing a real commitment to its customer base by exchanging the keyboard," says John Koenig, an owner of a seven-store Computerland chain in Cleveland. "People focused in on the Chiclet keyboard to the exclusion of everything else. Now that it's resolved, I think people will re-evaluate the PCjr as a home computer."

## Speaking of Computers: Kids Say The Darndest Things

"I want an Apple."

Melinda Garner, a first-grader demonstrating IBM's new Writing to Read program, replying when asked what type of computer she wanted for Christmas.  
New York Times, August 1, 1984.

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# 'Writing to Read' Just Right For PCjr, Kids, IBM Bets

To bolster place in education market, IBM slices PCjr prices, endorses reading laboratory, soups up software

BY CONNIE WINKLER

NEW YORK—IBM's PC division has placed its imprimatur on a PC-based learn-to-read program, *Writing to Read*, and in so doing is laying claim to the school market Apple Computer has courted so lovingly. IBM obviously hopes *Writing to Read* and several other education

pated in the *Writing to Read* pilot project—attended the summer press conference and demonstrated the product.

The *Writing to Read* reading lab has just been endorsed by the Educational Testing Service (ETS), of Princeton, N.J. ETS, with which IBM has worked in



packages it announced recently will boost PCjr sales. To that end, IBM also granted generous discounts for schools so that an enhanced PCjr—with color display—costs them only \$950 or \$900 in large quantities. The special school prices will be available to teachers and other full-time faculty members as well, IBM officials said.

And IBM cleaned up the PCjr's keyboard, introducing a new one more like a standard typewriter keyboard. It promised to substitute the new keyboard on already-purchased PCjrs (see related story).

Attending the *Writing to Read* announcement were youngsters who had participated in an IBM-led evaluation of the language laboratory program, which uses various media to teach kindergartners and first-graders how to read. In an unusual circumstance for a typically somber IBM press conference, the children who starred in a product film clip—and indeed partici-

ated in the *Writing to Read* to be "an effective education program for teaching reading and writing." "Writing to Read has had a powerful impact on the learning of the children," said Richard Murphy, senior research psychologist at ETS. ETS results showed, IBM reported, that on the average, *Writing to Read* students progressed faster than the national norm on standardized reading tests. The evaluation covered 10,000 kindergartners and first-graders in 21 sites in Southern states.

In the *Writing to Read* approach, teachers use a combination of personal computers, tape recordings, typewriters, and written materials to reinforce their lessons on reading and writing. The concept was developed by John Henry Martin, a retired educator and president of JHM Corporation of Stuart, Florida.

"We believed from the beginning that *Writing to Read* had

great potential for teaching children to read and write, but we and Dr. Martin wanted to be sure that it was thoroughly tested," said Philip D. Estridge, president of the PCjr's Entry System Division.

For a system accommodating 120 students per day, IBM estimated the cost for four PCjrs and the *Writing to Read* materials at \$10,000 and the cost for additional materials at \$5,000, a per-student cost (over five years) of \$35 per student. *Writing to Read* will be available in September through IBM's National Marketing Division sales representatives.

For educational software, IBM introduced:

- *the Earth Science Series*, four programs on processes in the physical environment, and how they're affected by people.

- *Rocky's Boots*, which teaches the basics of computer logic and electronic circuitry as game players build simulated machines to solve a variety of puzzles.

- *BASIC Primer*, Version 2.0, including lessons specifically for PCjr, uses graphics to illustrate programming concepts and teaches the most useful comments and statements in the BASIC programming language.

- *Private Tutor*, Version 2.0, with enhanced graphics and video disk compatibility, is a self-study system for a teacher to use with other educational programs to give lessons or quizzes, or alone to create new course material.

- *Teacher's Quiz Designer* helps instructors create and administer quizzes, as well as record students' scores, analyze test results and track class averages.

## Dr. Logo Stops End User Calls

PACIFIC GROVE, Calif.—Not satisfied with the performance of its retail-oriented Logo language operations, Digital Research, Inc., (DRI), has decided to shut down the consumer part of the division.

The decision affects four of the nine Logo division staff members; the four were involved in managing retail sales of Logo, but have now been reassigned to other departments at DRI's office here. The remaining five Logo staffers will concentrate on OEMs.

Also affected are DRI's plans to market new Logo products on a retail basis, including some new, low-cost, Logo learning packs and a 128K PCjr version.

"There have been no layoffs, or anything of that sort," said Fred Cutler, general manager of DRI's consumer products group. "The decision to reorganize our Dr. Logo division comes as a result of a greater emphasis on our OEM effort. There have been many, many requests from OEMs for high-class Logo products. From now on we will market Dr. Logo only directly to OEMs."

Cutler also admitted that a general "softness" in the software market and disappointing sales of the IBM PCjr contributed towards the dismantling of the retail operation.

"We're not giving up on Logo. Work is already taking place on new versions," added Cutler, referring to the Motorola 68000 and Intel 80286 versions of Logo reported to be under development. Other work carried out by DRI's consumer products group included the marketing of a high-school education training package called *Owlcat* and continuing research into the development of computer/videodisk technology.

—Robin Webster

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## Troubled VisiCorp Shifts Visi On Code To CDC for Cash; Sticks to Selling

Mainframer Control Data, in search of an integrated product, plans to offer Visi On on Business Information Services on-line network

BY ROBIN WEBSTER

SAN JOSE, Calif.—After legendary problems in trying to develop and market the Visi On windowing package and integrated applications environment, VisiCorp has called it quits. The complete source code and "all the theoretical technology" behind Visi On has been sold to Control Data Corporation (CDC), headquartered in Minneapolis.

From here on, mega- and minicomputer maker CDC will assume responsibility for maintaining and enhancing the Visi On system (as well as the existing application programs: *Visi On Word*, *Visi On Calc*, and *Visi On Graph*). However, VisiCorp retains the sole world rights to market the product via retail channels.

The fact that VisiCorp sold the rights to Visi On may not amaze those who have been following the saga, but the fact that CDC saw fit to take over the product may leave them puzzled. After all, CDC does not have a high profile in the personal computer business—although it does sell OEM personal computers through its business centers, under the CD 110 and CD 120 labels.

Shedding a little light on the subject, a CDC spokesman stated that his company did not have any immediate plans to sell Visi On directly to individual end-users. "CDC will not be selling Visi On in the retail market—VisiCorp maintains the sole world rights for that business," said the CDC spokesman. Instead, CDC will supply Visi On as part of its on-line Business Information Services network. BIS subscribers using compatible machines will soon be able to obtain Visi On from CDC.

"There was a realization

within CDC that we had to buy a product like Visi On or produce something equivalent ourselves. Clearly, we decided to buy. It wasn't a snap decision; CDC was very interested in Visi On from the beginning. To us, it seemed to provide the kind of open-ended environment for ap-

plications that we were looking for."

To integrate Visi On into its BIS network, CDC intends to develop one of the Visi On "missing links"—a compatible communications package.

The CDC spokesman was not able to comment on a report

that, in addition to Visi On, his company had also reviewed Lotus' *Symphony* package and Ashton-Tate's *Framework* package for possible adoption, but not purchase.

However, he did confirm that job offers had been made to the eight remaining members of the Visi On development team.

### Follow the Money

The proceeds from the sale of Visi On (the amount has not been disclosed) will be of some relief to VisiCorp, which has been battered from many sides as of late: it is still engaged in a legal slugmatch with Software Arts over who actually "owns" the rights to current versions of *VisiCalc*. And an executive search continues to replace company president Terry Opendyck, who resigned in July. Additionally, VisiCorp has cut its payroll down from 180 to about 70 employees.

The effort to develop Visi On severely strained VisiCorp's resources. As one company source explained: "Our development cycle was too long; we were not in a position to put all the Visi On pieces together in time. On the other hand, CDC is a multibillion-dollar company, with enough resources to do the kind of things we would have liked to do. This deal will actually accelerate the development of Visi On."

Visi On has been criticized for being too expensive and too slow; the fact that it needed 512K of main memory and a minimum of 5 megabytes of hard disk storage didn't help either. VisiCorp addressed the price problem by drastically reducing the cost of the Visi On applications manager. According to VisiCorp, the speed problem will be tackled by a faster product, Visi On Version 1.2, set for launch in early fall.

However, it is not clear what will happen to plans, which VisiCorp announced at the National Computer Conference in July, for a cut-down, floppy-based version of Visi On. Indeed, such a limited product would seem to run counter to the whole concept of multi-application integration that VisiCorp tried to exploit. ■

## New Hardware Focus for Microsoft

BELLEVUE, Wash.—Ever so quietly, Microsoft has stopped selling its RAMcard and SystemCard add-on boards for the IBM Personal Computer.

The decision coincides with the start up of a new Microsoft division—the Hardware and Peripherals division—and is the result of a rethinking of Microsoft's hardware production philosophy: Microsoft will no longer market hardware that does not, in some way, aid the products developed by the company's software division, the software leader reported. The rethink was directed by Bill Rowland (formerly of Eagle Computer, now general manager of Microsoft's hardware division) and Vijay Vashee, marketing manager of hardware.

"Our charter is that the hardware division will now focus on making products like the Microsoft mouse, which adds value to the *Microsoft Word* text processing package, and the recently announced booster product for the IBM PCjr," said Vashee. "Clearly, the RAMcard and SystemCard boards that

we produced did not pass that test. These products simply added more memory or a few extra functions and did not directly provide needed facilities for our software products."

The Microsoft RAMcard gave IBM PC users up to 256K of extra memory that could be configured as a RAMdisk. The SystemCard was a multifunction board that featured up to 256K of RAM, a clock/calendar, a parallel and a serial port, and print spooler/RAMdisk software.

In addition to the mouse and PCjr products, Microsoft's hardware division will continue to sell the SoftCard for the 8-bit Apple II; this product escapes the junk pile since it allows Microsoft to sell software onto the non-Intel-based machine.

When asked if more "acceptable" hardware add-on products were planned for the IBM PC, Vashee indicated that ideas were being evaluated, but nothing was ready for announcement. "We won't develop a new multifunction board just for the hell of it," he said.

—Robin Webster





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# Has Time Come to Distribute Software Programs Electronically?

Despite false start by Xante Corp., venturers move ahead with alternate schemes to deliver software to retailers—and users

BY JAMES LANGDELL

NEW YORK—So you want to be a software manufacturer? Just put a blank disk in the B: drive, an unprotected program disk in the A: drive, and type COPY A:.\* B:. Congratulations! You've manufactured your first piece of software.

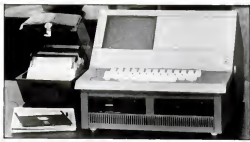
Imagine if buying and selling software was that easy. Many companies are trying to launch electronic software distribution systems to bring this dream to reality. Early systems duplicated only videogame cartridges, but the newest wave of electronic software distributors plan to spin out disks on demand for the IBM PC.

If a store could manufacture program disks on the spot for customers, the software would always be the latest version and

the dealer would never be out of stock. The software might even cost less than existing packages and the store's owners could offer a wider range of programs because they didn't have to shelve a huge, expensive inventory. But even as three California companies—Romox, Inc., of Campbell; Softra, Inc., of San Diego; and Softyme, of San Francisco—have begun offering systems built around a machine that puts the customer's choice of program (from a selection of hundreds) onto a blank disk at the time of sale, a dark note has sounded over the field.

## Xante Zapped

A similar electronic distributor, Xante Corporation, of



Softra's Software Transaction System makes customers' disks from encrypted originals.

Tulsa, Oklahoma, recently declared bankruptcy (see "Xante: Software While-U-Wait," PC, Volume 3 Number 4, page 37). Xante's failure points up the risks all electronic distributors face in staking their success on new technology.

In theory, electronic distribution seems an appropriate way to sell software—that most high-tech of consumer commodities. But are its advantages enough to lead to profit? Why set up new systems when channels that distribute physical packages already exist?

"Electronic distribution is a 3-year proposition—it isn't all going to happen this year," cautions Paul Terrell, chairman of Romox. "With an evolutionary market like this, you've got to move gradually." He says that Xante (which PC Magazine tried unsuccessfully to contact) failed by moving too quickly into stores with an inadequate system; Xante risked that stores and videogame manufacturers were ripe for sudden change after last year's shakeout. They weren't.

## Romox Rolls Out Disks

Romox is a relative veteran in the field of electronic software

distribution, having placed terminals in 20 northern California stores last October. A store with a Romox terminal is now able to produce 625 titles from 31 publishers on reusable cartridges for a wide range of game machines and home computers. This fall, new Romox terminals will start producing 5¼-inch disks for personal computers, including the IBM PC.

The Romox terminals have a full-color screen that displays a catalog and demos of available software, and they run in attract mode (like arcade games) between customers. While the terminal is busy producing a disk, the screen shows the waiting customer ads for other products in the store.

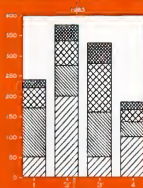
All the available programs are stored in encrypted form on the Romox terminal's hard disk. "It's basically an IBM PC-XT inside," explained Terrell. Stores can rent a cartridge-only terminal for \$220 per month, rent a disk-producing terminal for \$275, or buy a terminal for about \$5,000. Customers must use a special Romox disk, sold for \$5, that is already encoded with a serial number and a software protection scheme's elec-

(continued)

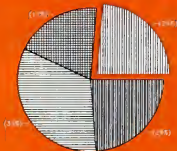


This fall, Romox terminals make PC disks as well as game cartridges.

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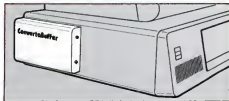
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### Distribution (continued)

Romox terminals are used by computer specialty shops and more general retailers. By attaching slots for particular cartridge or disk formats, Romox can customize its system to suit different retail locations. "I'd never install a disk drive in a convenience store," says Terrell. "On the other hand, screening ads for *Gorilla Chase* wouldn't sell many cartridges to customers in a Businessland."

### Communications Costs

The weakest part of Xante's distribution system, in Terrell's view, was that a store's Xante Production Station had to call a central Xante computer to download 20 percent of the program's code during each transaction. "Xante's dealers were surprised when they saw their long-distance phone bills," says Terrell. Since all of Romox's programs are contained in the store's terminal, "you don't have to stop and make a phone call every time someone wants to buy something." Romox picks up the tab for periodic calls to gather transaction data for billing and to download new and revised software.

As it installs the new disk-producing terminals, Romox will augment its line of games with productivity software. "There isn't such a glut in that area compared to the game-cartridge market," says Terrell. "And those products—with their higher price and slower turnover of packages—cause inventory problems that make electronic distribution even more desirable."

Documentation wasn't a concern for Romox with its cartridge products; a printed catalog included start-up instructions for all the games. For the more complicated disk-based program, Romox plans to provide basic directions in its catalog. When the customer runs a Romox disk, the first screen gives instructions for ordering a manual by mail for a nominal price.

### Manual Issues

"Our prices for software will be less the value of the manual

## Software Direct to Your Door Via Modem, Cable TV

NEW YORK—Tired of shopping for software? Two companies plan to deliver software directly to your home—through your PC.

Next year Gimcrax, Inc., of Minneapolis, will provide "electronic delivery" by downloading existing commercial software through a modem into your PC. However, Gimcrax does not plan to produce original programs.

Prices will be slightly less than the store-bought packages. "Customers expect a price advantage in exchange for not getting a physical binder or manual," says Nathaniel Forbes, founder of Gimcrax and former national retail sales director for Source Telecomputing. Brief documentation will be delivered electronically, and longer manuals can be ordered through a catalog.

To participate in Gimcrax's delivery system—which will not be called Gimcrax, customers can purchase a communications program, called *Blue Bars*, for \$50. *Blue Bars* is available now, but Gimcrax won't begin electronic delivery until the first quarter of 1985. In the meantime, the program can facilitate contact with other on-line communications services. (Gimcrax, Inc., 430 First Ave. N., Minneapolis, MN 55401, (612) 341-0920.)

### Cable for Nabu

Nabu—The Home Computer Network doesn't plan to sell any software...only rent it, using a link between cable television and home computers. Working like an optional cable TV service, such as MTV, the Nabu Network lets customers subscribe to "tiers" with different libraries of software for education (including Logo), entertainment, and personal productivity (including word processing and stock analysis programs).

By paying a flat monthly fee, subscribers to a tier can have unlimited use of its programs on their home computer—but only while connected to the one-way cable system. Nabu's programs can't be saved by customers for later use; data, however, can be stored on disks and used again when connected to the network's programs.

The encrypted code for up to 500 programs is transmitted over the TV cable at high speed (6.3 million bits-per-second); the full cycle of Nabu's programs repeats every 10 to 15 seconds. A special adapter decodes the program into a form the home computer can use.

Since May, Alexandria Cablevision has offered the Nabu Network to its subscribers in the Washington, D.C. area. There, in Nabu's first United States operation (Nabu's Canadian parent company began service in Ottawa, Ontario), subscribers must use Nabu's own \$299 microcomputer, which is a 64K RAM machine made by Samsung.

By spring 1985, when the Nabu Network will be offered by cable television services in 40 other regions, modem-like adapters for certain home computers, including the IBM PCjr and Commodore 64, should be available and will enable owners of these machines to access Nabu's software. "The modem is our key to software security," says John Hughes, a cofounder of the company. (Nabu—The Home Computer Network, 1199 N. Fairfax St., #300, Alexandria, VA 22314, (703) 836-2220.)

—James Langdell

and box," explains Terrell. He believes that manuals will soon be unnecessary. "There's already powerful software that doesn't need explanation be-

sides the help screens. With my favorite spelling checker, for example, I only had to learn three commands."

Terrell is confident that the

seasoned experience of Romox's principals will get their new venture through the long haul. Terrell started the Byte Shop chain and a group of software-only stores; another Romox executive was a founder of National Semiconductor.

"In 1982 they laughed at me," Terrell says. "It will be different in 1990 when we have a base of 50,000 retail outlets around the world." Romox, Inc., is at 501 Vandell Way, Campbell, CA 95008, (408) 374-7200.

### Softa: No Frills

Softa, Inc., is taking the most low-tech approach to electronic distribution—a term that its chairman, John Downing, shuns in favor of "distributed manufacturing." Softa's intention is to provide a superior distribution system that reduces some economic burdens while making few changes in how stores and customers do their business.

"We aren't a technology-driven company," says Downing. "If we could get the same results without building a magic box, we'd drop it."

Dealers can lease this "magic box"—Softa's Software Transaction System—for \$100 per month. It's a disk-copying workstation that Downing describes as "a cross between a postage meter and a paint-mixing machine...the kind that lets a hardware store sell 2,000 shades of paint without having to stock 2,000 different cans."

Technically speaking, Softa doesn't do electronic distribution at all. Software isn't transmitted from a central source, and the workstations don't even have hard disks. Instead, two disk drives are dedicated to making copies of programs from the store's library of encrypted disks. A customer's disk can be copied in less than a minute.

Initially, Softa will distribute software for the IBM PC and Apple II families. It already has distribution agreements with VisiCorp, Microrim, Sorcim, Peachtree, Eagle Software Publishing, Chang Laboratories, ATI, Context Management Systems, and Infocom.

(continued)

# Minis and mainframes have used WordMARC for four years. Now there's WordMARC word processing for your micro.

Originally created for minis and mainframes, WordMARC is now available for use on your micro\*. And quite simply, it's the best office-quality word processing software package a micro user could buy. After all, it was the best word processor mainframe and mini users like universities, national laboratories, and Fortune 500 companies could find over the last four years. But, if you need more proof, read on.

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\*WordMARC is compatible with the IBM PC or XT, as well as the Eagle, Compaq, Corona, NCR PC, DEC Rainbow, and TI Professional computers. All versions of WordMARC on micro, mini and mainframe computers are compatible.



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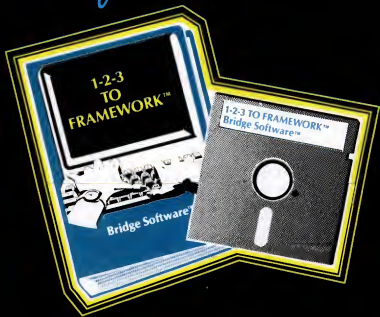
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**Distribution (continued)**

To prevent unauthorized use and copying of software, the encrypted disks can be duplicated only on Softra's workstation, which can't run disks as working programs. "We don't intend to have our machines demonstrate software," says Downing. "Customers ought to see programs running on the hardware they'll actually use." The workstation, however, can copy software demo disks for customers to try.

**Inventory Answer**

A customer's disk goes into a box with a manual—basically the same package the software's publisher normally provides. A consumer hardly needs to be aware of Softra's manufacturing process, since the copying process mainly involves the dealer. "When we asked our dealers," Downing says, "we found half put our station on the counter and half kept it in the back room."

If Softra's final products are so much the same, what's the company's advantage over traditional distributors? Softra allows dealers to account for the cost of a software package's physical materials apart from the value of the software itself. To stock sets of the standard packaging and manuals for programs, a dealer pays Softra just 20 percent of the usual cost of the software. The other 80 percent—the value of the actual program code—is charged only after a sale is made, and a disk is copied for a paying customer.

This economic arrangement allows dealers to stock a wider range of software while fronting much less money. Downing says, "We found that finances, rather than shelf space, limited dealers from carrying as much software as they wanted. In fact, many dealers desired empty software boxes to fill their shelves affordably."

At night, the dealer plugs the Softra station into a telephone line so Softra can call to upload transaction information, which it processes to bill the store and credit royalties to the software developers. Softra also uses this connection to pass on messages to the dealers.

For security, if Softra has been unable to contact a station at night, the machine automatically shuts down. It also stops operating if it's been used to copy more programs than the dealer's credit limit could cover. Downing claims that Softra-produced disks are able to recreate any protection scheme used by the software's original publisher.

Since May, Softra has operated its system at 20 computer stores in southern California, including some IBM-authorized dealers and ComputerLand of San Diego. This fall, Softra will equip more stores in other regions. Contact Softra, Inc., at 11055 Roselle St., San Diego, CA 92121, (619) 457-5311.

**Softrac's Fast Lines**

"Our business has been called 'Star Wars technology' by some people," says Robert Colton, chairman of Softrac. "What we do relies in the face of existing ways of doing business."

High end is going after the high end of the electronic software distribution business—business computer stores that sell at least \$300,000 of software each year. Using a high-speed transmission system, Softrac is the only electronic distributor planning to offer much software—particularly for vertical markets—that hasn't been available through traditional channels.

Retailers generate this software with the Softrac Master, a device that "looks like an office copier," says Colton. The Softrac Master can be linked to as many as 16 Softrac Express terminals that customers use as an on-line catalog. An Express terminal (basically an XT or a PC with a hard disk) can present "slide show" demonstrations of the software and reprint reviews and articles about the programs. With the assistance of a salesperson, orders can also be placed through this terminal.

At that time, the Softrac Master handles the transaction, making a link to Softrac's central computers over Tymnet for credit verification and other such functions. The Tymnet connections cost about as much as a local call; a more expen-

sive, high-grade connection briefly downloads the purchased software in a high-speed transmission from Softrac's central file server. Then the Softrac master produces the customers diskette.

For documentation, a mini-manual with the most commonly used commands is downloaded along with the software. (Softrac plans to incorporate as much information as possible into help screens in the programs themselves.) If a traditional, published manual is needed, the customer or retailer can order it through Micro D Inc. (a distributor based in Fountain Valley, California) and receive it several days later.

Softrac has some powerful allies. McDonnell-Douglas, the operator of Tymnet and co-developer of Softrac, invested about \$1 million in creating

Softrac's billing system and will represent Softrac to some of its present accounts. In some cases, McDonnell-Douglas may install Softrac Masters and Express terminals at corporate sites to speed delivery of software to these customers. Also, Micro D will provide its present outlets with some of Softrac's original software in traditional packages.

Softrac's equipment, according to Colton, has operated well in engineering tests. In late summer, systems will be installed in 12 stores for further testing. This troubleshooting stage will last as long as necessary before Softrac expands to more locations. "You've got to be 1,000 percent sure of a system like this," Colton cautions. Softrac is at 329 Bryant St., San Francisco, CA 94107, (415) 734-4600. ■

**A Chip off the Old Neck**

Have you ever wondered what happens to all those rejected microprocessor chips? Now, someone has found a use for them. Why not take a chip off your shoulders and wear one around your neck.

These real Motorola 68000 chips (the ones used in the Macintosh) have been mounted on an oval piece of alabaster



and encased in clear plastic. The settings can either be attached to a gold-plated necklace chain or to a silver-plated key chain.

You better hurry and order your chip jewelry now—there's no telling how long these chips will be available (or where they came from in the first place), the vendor says. Each chip gem costs \$9.95 and can be ordered from The Launching Pad Inc., Suite 2119, 500 East 77 St., New York, NY 10021, (212) 734-7513. ■

ocation begins.

breakpoint encountered at 0047:0007c. FROM CODE:116  
REAL TIME SOURCE CODE TRACE DATA

LINE	SOURCE or MODULE	NAME
------	------------------	------

```
fahr = inner;  
while (fahr < upper) {  
    Compute (fahr, decInches);  
    %c_temp = f_temp - 32;  
    %c_temp = %c_temp * 5;  
    %c_temp = %c_temp / 9;
```

```
nc:  
inner -17  
temp: 100  
mp: 18
```

High BP: 0047:0007c. FROM CODE:116  
REAL TIME SOURCE CODE TRACE DATA  
Atron's Source Code Debugger Version 2.01 (C)Copyright Atron Corp. 1984



## ATRON Announces A State of the Art Advance in Source Level Software Debugging

### PROGRAMMERS AND MANAGERS

know that finding bugs during new product development and over the entire product life cycle adds up to a significant portion of total product development cost and support time. Investing in the right debugging tools will greatly improve time to market as well as minimize development cost. Atron Corp. has the right debugging tools for the PC environment. These are:

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- 2) SOURCE PROBE
- 3) PERFORMANCE ANALYZER

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Program flow is saved in trace memory while running at full speed. PC PROBE can display trace data as high level language source code or as 8088 instructions. Real time trace answers the question "How did I get here?"

#### A Bullet of Proof Debugger

What good is a debugger that can be wiped out by an undebugged program? PROBE software is write protected and can't be changed.

#### Trap Memory Overwrites

The PC PROBE has 8 breakpoints and can trap conditions such as instruction execution, read, write, IO, DMA, interrupt, or external logic probes. Breakpoints can also be set on ranges of address or data — symbolically too!

#### Don't Look in the Manual

The PC PROBE designers know the importance of EASE OF USE. The PC PROBE interface has a menu window which displays the syntax of each command — so you never have to remember how a command works. It also recalls the previous invocation of each command to save tedious typing — and tedious thinking!

#### Symbolic Debugging

Avoid the tedium of sifting through link maps to find out where things are. The PC PROBE uses your C, PASCAL, or assembly language program symbols.

#### Macro Commands

Why be limited by a fixed set of debugging commands? PC PROBE lets you create your own powerful macro commands with parameter passing, nesting, LOOPING and IF/THEN/ELSE control.

### ANNOUNCING SOURCE PROBE

Why waste time with a debugger which shows your C or PASCAL programs in 8088 assembly language. Atron's new SOURCE PROBE let's you step, real time trace, and edit your Hi Level source code during debug. Display data structures in the format which your program uses.

### PERFORMANCE ANALYZER

How do you find time critical program problems or know where to start performance tuning your software? Get Atron's new Software Performance and Timing Analyzer. Then you can display histograms of how your programs run — by time or by events. You can perform many different timing measurements.

Atron has many happy customers who have made critical product schedules because of PC PROBE. Why waste time on primitive debugging techniques? — Call us today and ask for your 12-page data sheet



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CIRCLE 156 ON READER SERVICE CARD

## PRODUCT REVIEW

## Paradise Graphics Card: It's Easier Being Green

**Modular Graphics Card**  
Paradise Systems, Inc.  
150 North Hill Dr.  
Brisbane, CA 94005  
(415) 468-5320

**List Prices:** \$395 for base-board, \$125 for Module A, \$275 for Module B.

**BRISBANE, Calif.**—If you're among the majority of PC users equipped with only a green-screen monitor, you've probably discovered how much of today's popular software requires a color graphics setup. And if buying an additional RGB monitor and color adapter is a bit rich for your blood, the new \$395 Modular Graphics Card (MGC) from Paradise Systems may be your answer.

With the Modular Graphics Card, you can display all IBM color software on your mono-

chrome monitor, in 16 shades (intensity levels) of Kermit's favorite hue.

Unlike the Hercules Monochrome Card, which can also make Lotus bloom on a green-screen monitor, the Paradise Modular Graphics Card does not require individual, program-specific drivers (software modifications) for each program. You can simply boot up *PC Man* or *Flight Simulator II* and run it. This is because the MGC is inherently a color card: if desired, it will drive an RGB or composite monitor.

Previous attempts to use a color board approach to monochrome graphics have often had to settle for a three-quarter-height screen display and the inferior character set of IBM's color adapter card. The Paradise, however, offers a full-size



With the Paradise Graphics Card, IBM's COLORBAR program can run on a monochrome monitor, displaying the colors as 16 shades of green.

display, and its character set almost perfectly matches the familiar IBM monochrome typeface. (The Modular Graphics Card uses an 8-by-14 pixel character box rather than IBM's 9-by-14 box, resulting in two or three very minor differences.)

The design of the MGC board permits piggyback attachment of optional front and back modules that increase its versatility by providing serial, parallel,

and game interfaces (Module A), and/or a disk-drive controller, a clock, and up to 384K of additional RAM (Module B). These additional modules range in price from \$125 to \$275, and are carefully dimensioned so that, even with the add-on options, they require no more than one XT slot.

It is reliably reported that Kermit has placed the first order.

—Craig L. Stark

## PRODUCT REVIEW

## Bottomline V: Helpful But Hard to Handle

BY ALFRED POOR

**Bottomline V**  
ILAR Systems, Inc.  
1300 Dove Street, Suite 200  
Newport Beach, CA 92660  
(714) 476-2842

**List Price:** \$295  
**Requires:** 128K RAM, MS-DOS or PC-DOS, and Lotus' 1-2-3, MultiPlan, SuperCalc, or VisiCalc. (Other versions available for 3.5-inch or 8-inch disks, and CP/M or Apple DOS 3.3.) Printer optional but highly recommended.

When you have a complex job to do, you can often save time and money by hiring an expert to set up a system and show you how to work it. Spreadsheet templates do just that; they allow you to use your favorite program with prefabricated work-

sheets to solve complex problems. *Bottomline V* is a set of templates designed to make financial modeling quick and easy.

Financial modeling programs originated on mainframe computers but have recently been migrating down to micros. These programs require careful preparation of detailed financial information and yield valuable data for financial planning.

*Bottomline V* responds to this, problem by presenting three sets of predefined and formatted spreadsheets. I reviewed the 1-2-3 version on an IBM PC.

You use the Model template for long-range forecasts. By projecting sales and operating expenses as well as other factors, you can see how fast a new

business can be expected to grow. *Bottomline V* then takes this information and projects future financial statements as well as some highly sophisticated measures of company performance.

The Budget template helps you create cash-flow projections and develop a budget for company operations. The third set of prepared sheets is the History template, which tracks the actual performance of the same factors predicted in the Model template.

The templates come with a manual that is 120 pages long. Along with tabbed dividers and a table of contents, it includes a discussion of what financial modeling can do for you.

ILAR Systems, Inc. (formerly Strategic Software Systems, Inc.), offers a demonstration disk for \$10 with a 60-day money back guarantee (although it is not mentioned in the licensing agreement and is apparently only a guarantee that *Bottomline V* will do "everything we say it will do").

ILAR Systems says that these

templates make financial modeling easy. One brochure states that *Bottomline V* is "the only Financial Planning, Analysis, Modeling, and Forecasting System that Does Not Require a Knowledge of Accounting Principles: Does Not Require a Knowledge of Programming: Does Not Require a Knowledge of Your Spreadsheet Program!"

Unfortunately, *Bottomline V* does not come close to living up to these claims. Perhaps you can get by without knowing programming, but you certainly should have a good grasp of how to use your spreadsheet. For example, the tutorial section of the manual instructs you on how to fill in the various lines of the templates. For the Budget template, line 14 is labeled Interest Income, and the manual simply tells you to "review the program to determine the logic that we used." A look at that cell reveals:

```
C:14 (F0) bottom.text
IF(B10)>0,
(O.14*B10/12),0)
```

(continues)



**Bottomline V** (continued)

How many people with "no knowledge" of their spreadsheet programs could figure out the interest percentage assumed here? (Answer: 14 percent.) And how many would know how to edit the formula to make it fit today's rates?

**Modifications**

This question raises the issue of modifying the sheets to fit your own situation. In this case of interest income, there are two different formulas used in the row, so that if you were simply to edit the first column, and then replicate (or copy) it across the row, you would end up with a flawed worksheet.

The templates do not make use of many of 1-2-3's useful features. Cell protection is not used so you could easily enter a fixed value where a formula had been and damage the template in the process. Tables could have been used to calculate depreciation, but instead only

three methods of depreciation are described at the back of the manual. Titles, macros, and variables set aside in separate cells would also help.

ILAR Systems seems to be undecided about whether a user should make modifications to the templates. At one point the manual states that "one should be careful not to change the master templates supplied since this could lead to confusion when requesting technical assistance." Later on, however, you find out that "after one learns the spreadsheet system, he or she has the flexibility to modify this applications program to fit individual needs."

If you use *Bottomline V*, you will want to make modifications, unless your company manufactures a product—preferably a computer. You see, the expense categories are already defined. These categories include only a catch-all "travel expenses," but no breakdown of automobile, air, and lodging

costs. They do, however, include three separate computer system categories. There are even lines under the capital expenditures category for purchase of development computers, product acquisition, and a "show booth." The templates treat all sales revenues and expenses as if from a single product.

**Limited Manual**

*Bottomline V* is not an easy system to use. The manual is the same for all versions of the templates so you encounter all the instructions for all the systems. This "one size fits all" approach is probably the reason that there are no screen prints in the manual. The writing style rambles, and there are pages and pages of lists that repeat statements about the value of financial modeling and how *Bottomline V* can help your company. That space could have been better used to simply list the formulas of the different cells.

ILAR Systems touts its package as the equivalent of a "\$695 standalone system." Together, *Bottomline V* and 1-2-3 list for \$800. There are standalone packages that cost far less and do far more (see "OZ: Real World Management Control," PC, Volume 3 Number 15, page 57, and "Building Financial Models: Venture and Plan 80," PC, Volume 3 Number 8, page 153). These alternatives are certainly no harder to work with and cost considerably less.

Some template packages can be valuable additions to your collection, but this is probably not one of them. If you already have a spreadsheet program, then *Bottomline V* may save you some time as you develop your own worksheets for fiscal planning. It is cheaper (perhaps) than hiring a consultant to come in and set up the sheets for you, but you should still plan on spending considerable time and effort before you get the results you expect. ■

# Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
September 11-14	UNIX Systems Expo/84	Conference, exhibition for users and resellers.	Los Angeles Convention Center Los Angeles, CA	Computer Faire, Inc. 181 Wells Ave. Newton, MA 02159 (617) 965-8350
September 20-23	Userfest/New York	Hardware, software, and accessories.	Madison Square Garden New York, NY	Northeast Expositions 822 Boylston St. Chestnut Hill, MA 02167 (617) 739-2000
September 27-30	Mid-Atlantic Computer Show & Software Exposition	Hardware, software, and accessories.	Convention Center Washington, DC	CompuShows P.O. Box 3315 Annapolis, MD 21403 (800) 368-2066 (301) 263-8044
October 1-4	Info 84	Hardware, software, accessories, and seminars.	New York Coliseum New York, NY	Cahners Exposition Group 999 Summer St. P.O. Box 3833 Stamford, CT 06905 (203) 964-8287
October 29-November 1	COMDEX/Europe	Hardware, software, and accessories.	RAI Congress and Exhibition Centre Amsterdam, The Netherlands	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3330 (617) 449-6600
November 1-4	Consumer Electronics and Computer Expo	Selling show featuring consumer electronic and computer products.	Nassau Coliseum Long Island, NY	Expositions Inc. 33 Bell St. W. Babylon, NY 11704 (516) 293-5533



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## PRODUCT REVIEW

# Disk Changes PC Into an Oracle

BY JAMES LANGDELL

## Huang's I Ching

Kerson Huang  
P.O. Box 1083  
Marblehead, MA 01945  
(617) 631-5985  
List Price: \$69.95  
Requires: 64K RAM, PC-DOS  
1.1 or higher, one disk drive.

Why are PCs so popular? One key to their appeal is a fantasy, secretly held by many people, that the friendly beige box can predict the future and tell them exactly what to do to succeed. Why else would there be so many financial-forecasting programs that make bar charts projecting revenues to 1995?

When someone turns to a computer for predictions and advice, it can be armed with an analytic tool that's been field tested for over 3,000 years by emperors and hippies—the *I Ching*, now available on diskette. This Chinese oracle has a natural affinity with computers: its 64 hexagrams made up of six broken or unbroken lines comprise a binary logic system.

*Huang's I Ching* is built around Kerson Huang's new English translation of the classic Chinese text, also known as *The Book of Changes*. Huang, a physics professor at MIT, claims his text incorporates insights based on recent archaeological findings that make his version more precise than previous translations, including Richard Wilhelm's classic.

## Giving It a Try

The disk allows you to read Huang's texts for each hexagram, selected by name or by number, and also lets you approach the computer as an oracle. In that mode, you are prompted to think of the question that concerns you, then to press keys that trigger a random

selection of broken and unbroken, moving and unmoving lines.

## Reading the Lines

When the completed hexagram appears, you can read the meaning of its moving lines. To see the main texts for the original and transformed hexagrams, however, you have to return to the main menu, select the Read I Ching option, and

request the screens for those hexagrams. That backtracking is the most inconvenient part of using the program.

Some parts of *Huang's I Ching*, however, were meant to be difficult. Traditional ways of consulting the *I Ching* involve elaborate processes of gathering sticks or tossing sets of coins. These time-consuming methods insure that a questioner will meditate long on the question before the oracle yields up its answer. When a hexagram pops up at the touch of a button, its significance is cheapened.

Huang has tried to reduce this spiritual debasement by deliberately making the hexagram selection process somewhat cumbersome to use. To inspire more respect for the *I Ching*, his program allows only one question to be asked at each session. If you make further requests with-

out reloading the program, the program replies, "The oracle has retired."

Sure *I Ching* is a venerable classic...but does it work? I gave it a try. Due to a recent mishap, I was locked out of my apartment. My options were to make an attempt to break into my own room or to spend the night in a hotel until my house keys returned.

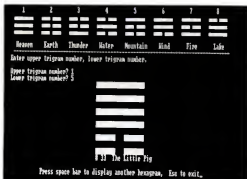
I asked *Huang's I Ching*. The result? Hexagram 33 with the first and sixth lines moving. Huang's text told me this: "The Little Pig. Sign of the Sacrifice. Auspicious for small things." For the first line: "A little pig's tail. Danger. Do not go anywhere." And the sixth line: "A fat little pig. Everything goes."

The answer seemed to point clearly to me staying put and treating myself to a hotel's comforts. I didn't see, however, what sacrifice and pigs had to do with my problem.

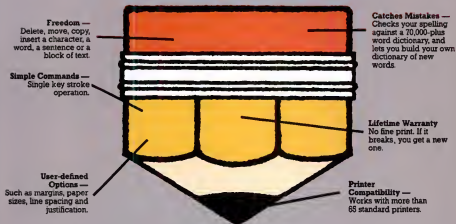
The style of Huang's translation is in the tradition that preserves the poetic ambiguity that enables the *I Ching*'s messages to apply to countless situations, while leaving most readers mystified. Another translation, published by MIT Press in 1968, is probably better suited to the needs of executive PC users. *The Portable Dragon* by R. G. H. Siu is more in the Confucian tradition, in which the *I Ching* was used as a tool for governing and administration.

This is Siu's interpretation of hexagram 33: "Withdrawal. The times favor the small man. Retreat is proper for the superior man. The right moment needs to be selected, so as to control the nature of the withdrawal and to prepare for the countermove. Eventually, the hostile forces are brought to a standstill through dignified detachment."

Siu's text wouldn't have helped regarding my locked apartment, but it would provide a clear message to a Wall Streeter attempting a "greenmail" takeover. That high-roller's colleagues might feel uneasy if his desk was cluttered with yarrow sticks or Chinese coins. By using Huang's software, however, his *I Ching* habit could be a secret kept between himself and his XT. ■



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People in the News

# Alphonse Chapanis

'There are criteria that could be used to make things easier'

BY VIRGINIA DUDEK

BALTIMORE—When he finds things that are poorly designed, Alphonse Chapanis gets mad and decides he isn't going to take it anymore.

"When I get into an automobile and can't figure out how to turn on the headlights, there's no reason for it," says Chapanis. His no-nonsense approach has led to the awareness of errors ranging from the way medicine is distributed in a hospital to mistakes in the design of the control room at the Three Mile Island nuclear plant. This far-ranging work has earned him the title "Father of Ergonomics" in this country.

Ergonomics, or the science of human factors, is an increasingly popular interdisciplinary approach to designing a "work environment for safe, comfortable human use." Working with many corporations and governmental organizations for 40 years, Chapanis has contributed to the research and development of ergonomics, but he has recently focused on improving the computer work environment. "It's one of the big areas in human factors," he says, noting that major manufacturers like Hewlett-Packard, Xerox, Texas Instruments, and IBM all employ human factors specialists.

The author of a landmark book, *Applied Experimental Psychology—Human Factors in Engineering Design*, published by John Wiley & Sons, Inc., in 1949, Chapanis has received several distinguished awards. He was a professor at Johns Hopkins University and currently heads his own human factors consulting service.

Chapanis first became involved in ergonomics during World War II. After receiving his Ph.D. in psychology from Yale, he was asked by the U.S.



Air Force to study the problem of the large number of airplane accidents not attributable to enemy forces. Although the common perception was that the largest source of accidents was "pilot error," Chapanis investigated the psychological problems of airplane design and found different results.

"The design of the aircraft was inviting pilots to make mistakes," says Chapanis. "No one thought of redesigning the cockpit as a way to eliminate errors." As a result of the investigation, many significant improvements were made in aircraft design.

But while the application of ergonomics is well developed in some areas, such as in aerospace technology, other areas such as the nuclear power industry have only recently applied ergonomics to the design of their facilities.

"In almost every instance, Three Mile Island was a classic textbook case of design error in the control room," says Chapanis. The 1979 nuclear power plant accident revealed several bad design features that made important information unavailable. For example, tags covered up important control displays and made it impossible for workers to act in an emergency,

Chapanis is particularly adamant about making it easier for the small business or personal computer user to bring technology into their lives. "The programs and documentation manuals are just bloody awful," he says. "The applications programs for the PC use esoteric abbreviations, and the help messages are not helpful." While he believes it would be hard to write standards for software, "there are criteria that could be used to make things easier."

Also, there are some general standards that can be applied to the computer work environment and to hardware, such as the design of the keyboard, the height of the worktable, and the control of lighting glare—all of which can make life easier for the user. In some countries, namely Germany, France, and Sweden, such standards are law.

Chapanis has also worked on refining the application of ergonomics to industrial and consumer products. He worked with Bell Labs 30 years ago and conducted experiments that led to the present set of keys on the push-button phone. Chapanis conducted a broad population study and asked people where they would expect to find the numbers. "We tried different

configurations and tested them by keying in numbers," says Chapanis, "until we had the combination with the fewest errors in the shortest period of time."

However, the configuration of numbers on the push-button phone did not translate to the configuration on calculators or on the numeric keypad of personal computers. In that instance, a decision was made to number from the bottom up instead of from the top down.

Chapanis notes that many people, in particular engineers, have varying responses to ergonomic principles. Reactions range from, "It's about time they did that" to "I'm surprised it hasn't been done before."

"Not everyone is an engineer," says Chapanis. "Just because an engineer can operate a machine doesn't mean other people will find it easy to use."

As far as Chapanis is concerned, "The universities can't train people fast enough to fill the demand" for ergonomics professionals. "Job opportunities are everywhere," he says, "and it's practical, good for society, and increases the ability with which people can use technology."

Chapanis will be a keynote speaker this fall at the World Conference on Ergonomics, which will travel to Los Angeles, Chicago, and New York. He will give a presentation on using ergonomics to increase worker productivity and acceptance and will conduct two workshops: Rules for Talking with Computers and Good Input Languages and Procedures.

"There certainly are a lot of bad designs," laments Chapanis. "That's why there's a lot of work for us to do."

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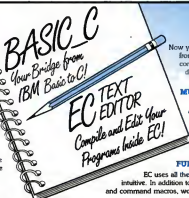
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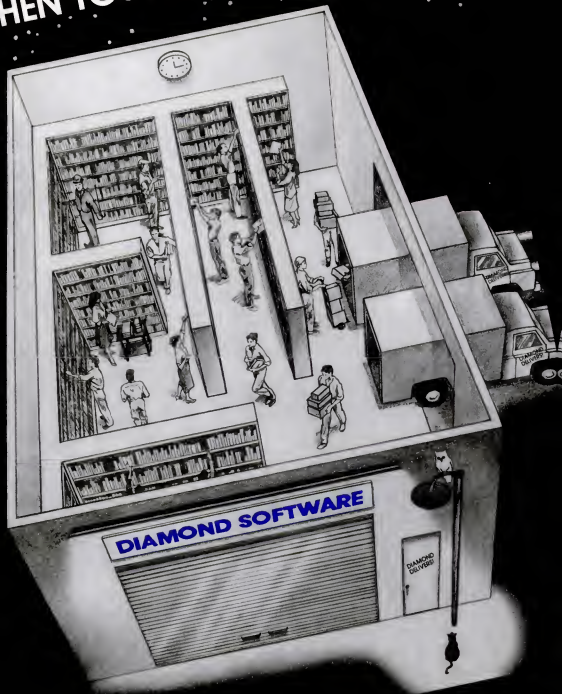
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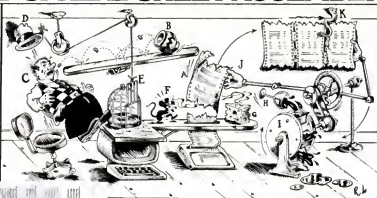
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# Curing an Artist

Art director Mary Zisk bows to the pressure of the times and overcomes her computer phobia. But did she really? Can artists and computers ever resolve their differences?

**D**oes the art director of the largest, most frequently published computer magazine dare admit that she had never touched the keys of a PC; never booted, copied, filed, or exited; and didn't know her RAM from her ROM? Well, I admit it! But it's no longer true.

While most of our editors are pecking away at their PCs in dimmed rooms, we in the art department have kept our distance from those mysterious boxes. Is there something in our artistic spirit that makes us distrustful of this technology? Some fear of dehumanization? Or perhaps an aversion to a "controlled" system that seems opposed to the spontaneity needed to create art?

Whatever the reason for this phobia, I had been able to perform my job as art director creatively and accurately, finding new and surprising ways to depict the PC, while still keeping my distance from the technology. At some point, I began to realize that my relationship with the PC needed to become more intimate.

Having previously worked for a national science magazine, I had read article after article about the computer in our future working society. I began to feel convinced that if I didn't master this machine, I would be replaced by some whiz kid who'd been weaned on bits and bytes since she was knee-high to a CPU. I feared being turned out to pasture before

reaching 40 and imagined myself longingly remembering the good old days of paper, pencil, and T-square while cursing electronic page makeup. Learning how to use a computer became not so much a nov-



Mary Zisk

elty, but actually a matter of survival.

So in order to ensure my survival, I began asking questions and looking over the shoulders of editors at their PCs. Paul Somerson, special projects editor, offered to spend an hour introducing me to the wonders of BASIC. Afterward, he said, I'd be able to continue learning on my own. That became my New Year's resolution.

Then, late one evening as I sat at the drawing board, I heard a commercial on the radio about a Computer Immersion

Weekend using IBM PCs. Eureka! A path toward fulfilling my resolution. A few weeks later, Nancy Lepow, art director of *PC Tech Journal*, and I headed north to the State University of New York at New Paltz to immerse ourselves in this foreign technology.

Our session began on a Friday evening with a short introductory lecture. Then we 15 neophytes inserted our 15 DOS disks into our 15 disk drives. Once I got past the hurdle of typing in the date, I became thoroughly engrossed. I used *SuperCalc 2* to figure my monthly budgets for illustrations, photographs, and photostats. Using *PC-WRITE*, I made chunks of sentences disappear and magically reappear in a new location. I was excited to discover I could create a database with *PC-FILE* that would list those of my friends who play tennis and those who like sushi and/or Sunday brunch.

By the end of the workshop on Sunday afternoon, after 18 hours of getting to know my new green-eyed friend, my head was spinning with the PC's artistic and administrative potential.

When I returned to the office on Monday, I immediately started hanging around the PC Toy Shop, hungrily eyeing software and hardware. Suddenly, technical assistant Mike O'Cone was no longer the most desirable piece of equipment in the Toy Shop.



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CIRCLE 101 ON READER SERVICE CARD

## Mixed Feelings

The editors, seeing the stars in my eyes, began to fill me in on equipment with graphics capabilities. Paul Somerson

demonstrated an animated color project he had created on his PC using BASIC. Patterned letters changed colors as a frog danced around the screen with musical

accompaniment and other sound effects. I admit—it was dazzling. But for some reason—perhaps because of my attachment to the pleasures of oil paint—I have no desire yet to learn computer graphics.

This just goes to show that artists have mixed feelings about computers. Though illustrators are embracing computer graphics, and while computer graphics classes are being greeted enthusiastically by students and instructors at many art schools, I see a strong trend in illustration toward


**The PC is a  
valuable aid  
and no longer a  
box to be feared.**

looser, more painterly and emotional styles. I believe this is a direct backlash against computer-generated imagery that some artists see as a threat to their work.

I'm sure this conflict among artists will continue to exist. But through my immersion, I've been awakened to a new tool to help me organize my business world. I now have all my illustration and photography assignments in my BIGART database. I can instantly change each assignment to a different issue and print out a new assignment list. I can quickly find out how much money I've spent so far in an issue, how much is left in my budget, or how much I'm over budget. This is essential information, since I juggle three issues at once.

This is only the beginning. As I struggled to write this article on a typewriter, with paper strewn all over my dining room table, I longed for the pleasures of word processing on the PC.

I've got a long way to go, but after my weekend immersion, I now understand the potential of the PC. It's no longer a box to be feared, but a valuable aid in helping me manage efficiently (so that I can go home on time and paint!). ■



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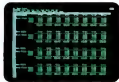
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# Price Manipulation

IBM's price cuts this past summer may seem large, but only for those who otherwise buy all-IBM packages. "Savvy" shoppers who buy mail-order components in fact save less.

**I**n its latest round of price cuts for the PC family, IBM took a page out of the auto makers' manual and gave potential PC purchasers a deal—although Big Blue may not have all its cards on the table.

The largest of these summer price cuts was 23 percent; it made a PC with 256K RAM, one double-sided disk drive, a monochrome board, and a monochrome monitor available for \$2,520 (it was formerly \$3,279).

What IBM did was similar to what auto manufacturers often do: it made formerly optional equipment standard and then compared the price of the new "loaded" package to the former product-plus-options price. (Indeed, IBM has played similar tricks in repricing its larger systems.)

So how big is the IBM price cut, really? For big-business types who prefer to order an all-IBM package rather than mess with substituting some mail-order parts, the price cut amounts to the full, and large, 23 percent. But knowledgeable individual users or small business owners to whom every dollar counts often assemble their PCs in a different way, by shopping around for compatible, but less-expensive, components and buying parts from mail-order firms. The price cut is still significant to these buyers, but it is well below 23 percent.

Let's assume you are shopping for a PC and trying hard to save a buck—before the price cut. You'd probably buy "cheap memory": mail-order 4164 64K chips. These are widely available for \$50,



Dexter Hart

so you would pay \$150 for 192K RAM instead of the original IBM price for dealer-installed memory, \$495 (192K RAM is now standard with the system unit). At this point, your system would cost 14.1 percent, or \$414, more than an all-IBM system after the price cut.

In addition to cheap memory, though, you could substitute the fully equivalent \$180 Amdek monochrome monitor for the IBM monitor that was formerly priced at \$345. Now, the price cut saves you 9 percent, or \$249.

Like most PC owners, you'd probably install a second drive, and as a do-it-yourselfer, you would buy a mail-order drive (most come with installation instructions). A double-sided, full-height Tandon drive is available for \$210; the IBM post-price-cut price is \$425 (\$104 lower than before). Making this final adjustment, the difference between the do-it-yourself price and the IBM post-cut price is only \$45. You save a grand total of 1.1 percent by buying IBM now.

You still probably wouldn't buy the all-IBM package. But by combining the price cuts on the basic system, memory, and adapter with smart shopping, you could save a few hundred dollars more.

A savvy consumer can go even further. You could certainly buy a no-drive unit and add both drives, and you can get a color/graphics board instead of the more expensive monochrome and run it on an inexpensive composite-video monitor. The display isn't quite as crisp and detailed, but it's satisfactory.

So how good is the price cut? Actually, it's a good deal for either type of buyer. If you can make intelligent substitutions, you'll always pay less than the buyer who takes the easy route and buys the all-IBM system. ■

*Dexter Hart is a free-lance writer whose work often appears in Boating magazine.*

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# Letters to PC

## Heat-Induced Damage

I read "Stress Tests for Floppies" (PC, Volume 3 Number 13) by Howard Karten with great interest because of a similar experience I had stress-testing floppies.

In the summer of 1977, I was involved in electromagnetic pulse (EMP) tests of the E-3A (AWACS) at the Air Force Weapons Laboratory in Albuquerque, New Mexico. The AWACS were parked under a large semicircular antenna and subjected to intense electric and magnetic field pulses designed to simulate the long-range electromagnetic effects of a thermonuclear explosion.

Most of the data collected during several months of testing were stored on hundreds of floppy disks for later analysis on one of the most advanced microcomputer systems of the time—a North Star Horizon with a Z-80 microprocessor, 64K of memory, and two 90K floppy drives. Naturally, we were concerned that the floppies would get "zapped."

When an aircraft is subjected to an electromagnetic pulse, it resonates at characteristic frequencies in much the same way as a tuning fork. The electric current flowing through the outer skin of the wings and fuselage can be quite large when the resonances are excited. In view of this, we taped a floppy disk filled with test files to the fuselage of the AWACS and left it there for several dozen "shots" of the EMP generator. To our surprise, there was no loss of data.

Later that day, I mistakenly left a box of floppies with some programs (not test data) in my parked car in the hot Albuquerque sun. About half of them were ruined by heat-induced warping of the jackets. Fortunately, most were blank, but one contained some programs I had spent several days writing and debugging.

If you find yourself in a similar situation, don't panic. As long as the jacket has not melted onto the disk itself, you should be able to recover most or all of the files.

Take a razor blade or modeler's knife and carefully cut off the warped jacket. Inside is a very thin disk. Put it aside, taking care to touch it only by the edges.

Take a blank floppy disk and cut open



the jacket on the edge away from the read/write slot. (This is the edge you would hold when inserting the disk into the drive.) Slip the blank disk out and slip the disk from the warped jacket into the new jacket.

You should now be able to insert the old disk in the new jacket carefully into a floppy disk drive, close the latch, and copy the files normally to another new disk. You should copy the entire disk immediately because it might not last long in regular use.

I learned that floppies may survive in a nuclear war, but they won't survive in a parked car. Heat is the worst enemy of floppy disks.

Gary Bedrosian  
Delmar, New York

## Disk Drive Replacement

As a charter subscriber to PC and a long-time IBM PC owner, I am now faced with the problem of replacing the single-sided disk drives in my unit with double-sided

ones. In the process of deciding how to do this, I made a surprising discovery.

Apparently, the major manufacturers of floppy disk drives never advertise in any of the computer magazines I receive, nor have I ever seen their products in new product announcements. I have spent several hours searching for mailing addresses for Tandon, TEAC, and Panasonic without finding any.

The nearest computer dealer is a 60-mile round trip from my home, so I depend on magazines and mail-order catalogues for addresses and information. I haven't seen any articles giving detailed descriptions of the selection and replacement of PC disk drives.

You could do your readers a real service by publishing articles devoted to the disk drive replacement problems that must affect thousands of people who purchased the original IBM complement of equipment. I am sure many of your readers would find this information useful.

Michael Csontos  
Lima, New York

*You're right—disk drive manufacturers would rather sell to computer manufacturers than end users. Your best sources for replacement disk drives are the mail-order houses that advertise in PC or local (or not-so-local in your case) computer stores. You might as well replace one of your existing drives with a pair of half-highs. We've used TEAC, Amdek, Shugart, and Tandon drives in our offices with success. Your original single-siders will make great doorstops.—Ed.*

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## LETTERS TO PC

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Jerry W. Harris  
Nashville, Tennessee

### Not a True Contest

I was one of the many disappointed observers of the *Jack2* contest held in New York City this past March. I thought that the contest was unfair and reading Ed Baras' review of *Jack2* confirmed my suspicions ("Jack2 Sprints to the Fore," PC, Volume 3 Number 14).

My criticism is of the conduct of the contest. I will qualify my comments by saying that at the time of the contest I had not had the opportunity to use the software and therefore could not comment on how the package compared to its challenger, Lotus' 1-2-3.

My main issue with the contest was that the "problem" to be solved was of such simplicity that the contest became a matter of who could type faster. The problem did not even begin to exploit the full spreadsheet, database, or graphics capabilities of 1-2-3. After reading the review of *Jack2*, I now understand why the particular problem was chosen to be solved.



The contest first required about four lines of text to be typed. This is hardly a requirement for a word processor, although the Lotus contestant decided to use *WordStar* rather than the *Range Justify* command of 1-2-3. Could the *Jack2* personnel who taught all the contestants how to use their respective software have left

out this important command?

The next task was to create a small spreadsheet, enter some numbers, and then multiply two rows together to yield a third. This hardly tests a spreadsheet's function. Even a word processor with math capabilities can do this.

Finally, a graph was to be produced. As Baras indicates, *Jack2* can only reasonably produce bar graphs.

Although the contest was supposed to be independently developed, I found it remarkable that it seemed to highlight only the capabilities that *Jack2* was reasonably good at. I think *Jack2* should get out of the software pageant business and leave software evaluation to independent reviewers like PC's editors and software users.

Morris W. Stemp  
Forest Hills, New York

### Is It Real or Is It Vaporware?

I am prompted to write this letter for two reasons: my personal experiences and experiences related to me by others, and by the protests and warnings that appear frequently in magazines serving the microcomputer user, both in editorials and in user feedback.

The Federal Trade Commission (FTC) has specific rules and regulations that apply to purchases by mail for the protection of consumers. While not applicable now to charge-card and phone orders, the practices of many microcomputer vendors may hasten the day when the FTC extends its reach.

Personally, I am very surprised at my tolerance of this problem, especially after some very frustrating experiences with software vendors. I attribute this attitude to the fact that I sincerely believe that the advertised products actually exist, but that they have not been sufficiently refined to be worthy of sale. Given a choice, I'd rather wait a little longer and receive a quality product, especially if I have not paid for it, or been charged for it prior to shipment.

Barbara Krasnoff's description of certain practices as "predictive advertising"

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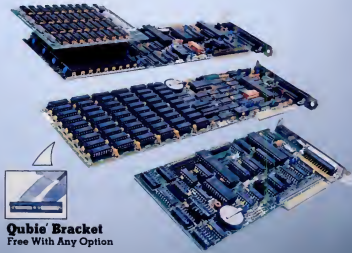
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## LETTERS TO PC

("No Matter Who's Invited, Some Will Turn Out to Be Incompatible," PC News, PC, Volume 3 Number 5, page 57) was a very gentle way of describing a poor method of marketing products. Another writer has dubbed it as "vaporware," which is probably more appropriate.

Both descriptions of the practices are euphemisms. Choose your own word: fraud, deceit, or misrepresentation. By any name, it's wrong and unfair and an increasing number of people are inconvenienced, discouraged, and hurt.

I think you should be communicating these issues and their possible consequences to your advertisers. The practice of advertising undeliverable microcomputer products is so prevalent that I won't refer to any particular vendor. The issues of responsibility for availability of advertised products in the retail marketplace is well established, although partially as a result of some previously enforced disciplines by government agencies.

I hope the microcomputer marketplace can demonstrate more responsible behavior and I think PC can and should play an influential role in this regard.

Raymond A. Jacobson  
Chicago, Illinois

### A Consultant May Be Needed

As a computer consultant, I read with interest the letter from Chris M. Kinsey on the subject of using Information Unlimited Software's accounting packages ("Software Flaw," Letters to PC, PC, Volume 3 Number 14, page 93).

He indicated that both he and his clients were surprised when they went to run the first quarterly reports, only to find that the IUS package doesn't do quarterly reports. Since these reports were so important, they had to shelve the software and do the reports by hand. And they haven't used the software since.

Experiences like these point out the growing importance of bringing in professional computer consultants to help businesses ensure that they are purchasing the right hardware and software. Too many

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times a business is willing to spend \$7,500 to \$12,000 on a computer system and will balk at spending \$200 to confer with a professional consultant on the purchases.

The computer industry is now too complex for the first-time computer buyer to go at it alone. When people with no idea of what's going on in the computer industry spend \$2,500 for a software package that doesn't fit the bill, it produces ill will within the industry, no matter who's at fault.

Ralph E. Freshour  
Redondo Beach, California

### New Pagination

In your answer to David Clore's letter about stringing *WordStar* files together for printing as one long file, you established a queuing file for *MailMerge* to print ("Queuing Files," Letters to PC, PC, Volume 3 Number 10, page 94). The method outlined has the problem of printing continuous page numbers. To avoid this, make certain that the .op command is issued to turn page numbers off or that .pnl is placed after each .pa command. The file would then look like this:

.fi FIRST.FIL

.pa

.pnl

.fi SECOND.FIL

.pa

.pnl

.fi THIRD.FIL

If the .pnl is placed before the .pa, *WordStar* will end each document on page 1 and start the next on page 2.

Thomas E. Simondi  
Los Angeles, California

### Expansion Problems

A few months ago I purchased a Sanyo MBC 550. At the time I bought it, I didn't realize that there was no room for expansion cards. In the PC News section I read "A Classy Chassis" (PC, Volume 3 Number 12, page 57) and finally found an expansion chassis, but I do not think they will fill my needs. Could you please tell me how I can adapt expansion slots to my

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## LETTERS TO PC

computer? I really love PC. Keep up the good work.

Joey Spytek  
Vero Beach, Florida

Thanks for the words of encouragement; we wish we could offer you the same. At the present time the Sanyo 550 series does not accept PC-compatible expansion cards. However, according to Sanyo, a number of third-party companies (including Thoughtworks in Phoenix, Arizona) are making adaptations that will allow Sanyo computers to accept PC-compatible boards.—Ed.

## Corrections

The last line of Figure 3 was omitted in "Adapting Your Screen for Speedy Updates" (PC, Volume 3 Number 16, page 236). The missing line is:

410 NEXT I%:  
CALL FULSCRN%(SCRN\$(1)):  
NEXT J%

An error appeared in "Light on Pens" (PC Tutor, PC, Volume 3 Number 12, page 395). The program listing should include this final line:

1320 RETURN

Two of the function charts in "The Word on Word Processors" (PC, Volume 3 Number 17, page 112) were transposed. The chart on page 117 should appear on page 115 and vice versa. This should be the final word.

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# More Program Weight-Watching

Want to trim 7,000 bytes of flab off your program? Norton's weight-reducing program and the Lattice C compiler can help you to slim down a simple, do-nothing program by 80 percent.

**J**ust as an Olympic athlete doesn't have the same physical fitness standards as you and I do, one program's desirable features—careful error-handling routines or generalized input/output code, for instance—can be considered excess baggage in another program. As the old saw goes, everything is relative.

In my last two columns, we discussed how to cut excess program flab. This topic isn't often related to programming languages, but if you are interested in the practical issues of program development, you need to be aware of how the language you use affects your program's flab quotient.

## Systems versus Applications

One of the most important factors in program weight-watching is whether you're using a systems or an applications programming approach. The systems approach puts your program fully in charge of what the computer is doing but forces you to deal with many tedious details. The applications approach delegates the tedious details—handling of I/O and errors—to the operating system of standard programming language routines, removing them from the program itself. The program only deals with what it's trying to get done, thereby permitting the programmer to concentrate his energies

on the particular application at hand.

Most of the programs we use on our PCs aren't purely either applications or systems. Typically, a program needs to take on different characteristics for different purposes. For example, many pro-



Peter Norton

grammers find it worthwhile to generate display output directly on the screen, which is the systems approach. On the other hand, these same programmers are very happy to let standard DOS routines handle the reading and writing of disk files, which is the procedure in the applications approach.

Ideally, our programming languages and tools should give us a clear choice of approaches instead of forcing us to do things their way, but not all program-

ming languages do. For example, if you're programming in BASIC, especially interpreted BASIC, you're pretty much in a pure applications environment. BASIC fights hard to keep us from breaking out of the applications-environment safety net it creates for our programs. It doesn't mean you can't break out of the BASIC environment to work more directly with the computer; many programs do that successfully. But BASIC resists the process. It expects its standard routines to completely control the program; it anticipates a pure applications approach. Its protective stance denies us freedom of choice.

## Freedom of Choice

I'm happy to report I've discovered two languages—actually, they're compilers—that do give us freedom of choice: IBM or Microsoft Pascal and Microsoft or Lattice C. Each of these compilers is available in several versions from several sources, so, practically speaking, the selection is actually broader than just two.

The Pascal compiler, which Microsoft created and markets under its own name, is best known as the IBM Pascal compiler since it is also marketed and supported by IBM. It's been out in two versions, 1.0 and 2.0. As I mentioned in the last column, Version 2.0 contains many im-

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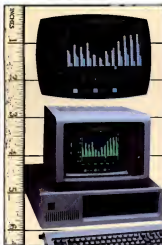
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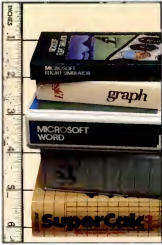
IBM's color/graphics card can display 16 colors on a color monitor.

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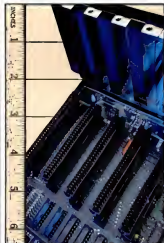
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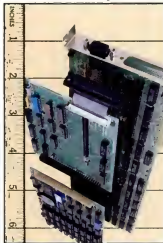
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improvements, including a simple way to avoid the flab of standard error-handling routines.

The C compiler is available from its creator, Lattice, which sells it through the software publisher, Lifeboat. Another compiler, which is essentially the same as Lattice's but revised by Microsoft, is also available under the Microsoft name.

The main virtue of these two compilers is that they offer their services in layers or levels that give us tremendous control over our programs. The lowest layer works in a very primitive way: it does simple tasks and reports what happened (including any errors). Higher levels build more sophisticated services and add error-handling. When you want applications-style hand holding, you can use the highest-level services; when working in systems mode, you can use the lowest-level services and do with them what you will.

In theory, we have full control over how our programs work and supposedly can control the amount of flab that the programming language brings in. In practice, however, it isn't that tidy, but we're still given a choice.

### Cutting Flabby Overhead

In previous columns, we've illustrated the cost of the flabby overhead that Pascal can add to our programs. Now, here are similar figures for C.

Previously, we examined an example of a simple, do-almost-nothing program for three factors: the size by itself; the size increase when we added some simple I/O; and the size reduction when we eliminated some standard overhead. Here is what happens when we do the same exercise for the Lattice C compiler. A simple, do-nothing program is turned by the compiler into a mere 21 bytes of code, before linking. (Pascal was comparable, with 33 bytes.) When we link it to add the standard overhead for this C compiler, the size of the complete program is 7,500 bytes—we'll be using

round numbers for simplicity—which becomes our basis for comparison, both for general overhead and for changes that increase or decrease the size of the program. (Pascal created a ghastly 18,500-byte minimum program size.)

Adding some simple screen and keyboard I/O routines increased the size of the program by about 3,500 bytes (Pascal grew by 4,000 bytes). Then, using a weight-watching program, I was able to

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reduce the program to a remarkable 1,700 bytes, an impressive 80 percent decrease. (By comparison, I slimmed down Pascal, using the techniques discussed in the last column, to the same 1,700 size, an even more remarkable 90 percent reduction.)

These figures show that while this Pascal starts out with substantially more flabby overhead (over twice as much), this Pascal and this C are equally amenable to systems programming-type weight reduction and that both add comparable overhead for standard I/O.

Another big advantage of C is that it gives us full control over the program's initialization or start-up code. All compilers use some standard start-up code for their programs, but normally we aren't allowed to tinker with these routines, or even learn much about them. This C compiler, to my delight, gives us the

source code—part in assembly language, part in C—for its start-up routines. If we want to, we can study it to see exactly what's going on, and if we need to, we can revise or even thoroughly change the way our programs start up. That facility gives us tremendous control over the destiny of our programs.

Other compilers for the PC may also give us full control over the start-up steps of our programs, but I haven't come across any yet. (Please write to me if you know of some I've missed.)

### Either Higher or Lower

I talked earlier about using high- and low-level services with a programming language to control some of the overhead incorporated into our programs. To test this idea, I looked at a program Texas Instruments includes with DOS for its TI Professional computer, a machine that is somewhat compatible with the PC. TI's version of this program, written in C using the standard high-level I/O services, was 12,000 bytes long and generated its output rather slowly. I wrote a similar program that does the same work but uses low-level I/O services—some that I created myself and some that came with my C compiler. The result was a program of only 3,000 bytes, one quarter the size, that generated its output as fast as the display screen could show it. In both size and speed, this program was a dramatic improvement—proof that it can be beneficial to use low-level services when appropriate.

To get this kind of improvement in size and performance, you usually need to be a programming expert. If you want to become this kind of magician but aren't sure you have the expertise, I recommend that you contact Blaise Computing of Berkeley, California, and consider purchasing its Productivity Tools, a programming tools package that covers the two languages discussed here, Pascal and C. If you don't know how to do the magic by yourself, Blaise will show you the way. ■

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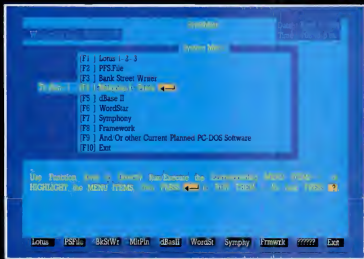
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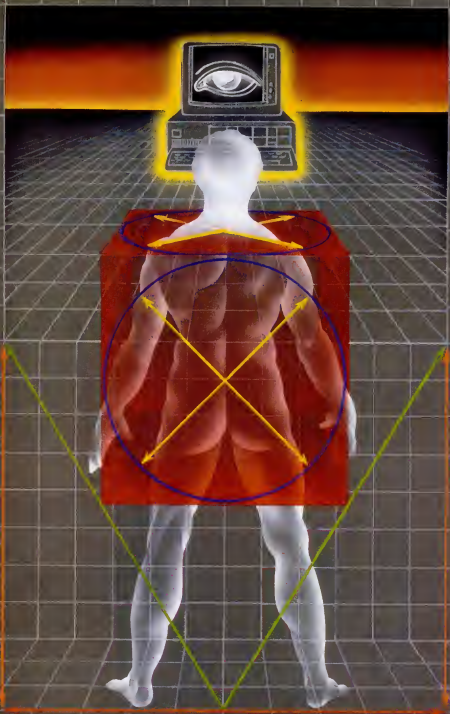
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CIRCLE 461 ON READER SERVICE CARD







COVER STORIES • SPECIAL REPORT


# ERGONOMICS: COMPUTING THE HUMAN FACTOR

Ergonomics, the study of designs for effective interaction with the human form, helped determine how the PC looks and acts.

Understanding the human factor—in keyboards, screens, accessories, chairs, and workstations—is one more way you can make sure to get the most from your machine.

Illustration: Carol Giffen

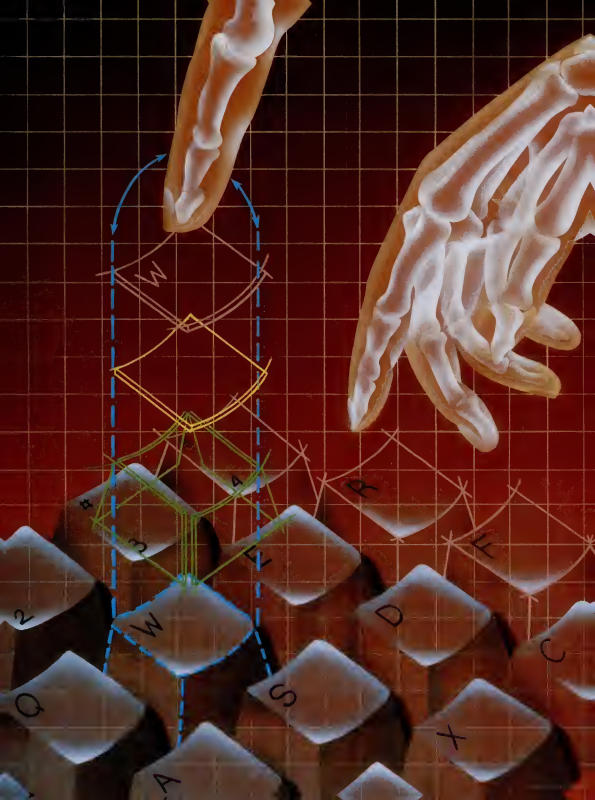




COVER STORY • WINN L. ROSCH

# KEYBOARD ERGONOMICS FOR IBM<sup>s</sup>

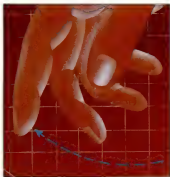
The keyboard may be the most tangible part of a PC, but its development is shrouded in mystery. An even bigger mystery is how to improve its quirky, controversial design.





**T**he first time I saw a person with a prosthetic arm, I was struck by the ingenuity of the design. The arm was made of a light-colored plastic and had a simple, functional design. It was a marvel of engineering, and I was amazed to see how it was made. The person who made it was a young man, and he was very proud of his work. He showed me how it was made, and I was impressed by his skill. The arm was made of a light-colored plastic and had a simple, functional design. It was a marvel of engineering, and I was amazed to see how it was made. The person who made it was a young man, and he was very proud of his work. He showed me how it was made, and I was impressed by his skill.

You don't get much choice: a keyboard—most are roughly the same size and keys, too. The same goes for the mouse and the trackball, which are ways to move the cursor around the screen. And the joystick, which is used for



The difference in typing speed between QWERTY and Dvorak depends on whose study you read.

order, which at best might be termed *alphaconfusatory*. Yet even a small variation in the design of a keyboard (from the letter arrangement to the force each key press requires) could make a great difference in the ease of using the keyboard. Surprisingly little is known about the effects of such variations, and what is known may surprise you.

### Singing Dvorak's Tune

Probably the greatest mystery is that "alphabetic-order-be-damned" arrangement of letters on the keytops, termed QWERTY for the first six characters in the upper left-hand alphabetic row. Obviously, the standard arrangement is not the only possible ordering of the alphabet. In fact, there are 26 factorial (exactly 403,291,461,126,605,635,584,000,000) possible arrangements of letters alone, not to mention the further complications of using rows of different lengths and non-alphabetic keys. The important point is to understand that not only is QWERTY just one of many possible layouts, it's probably not the best one.

QWERTY has a sketchy history. A popular notion holds that it was conceived to make typing difficult and slow because the first mechanical typewriters had problems keeping up with the first typists. As wonderful as that story might seem (it rings very true to many frustrated typing students), it's unlikely.

The first typewriter keyboard that Sholes laid out did use an alphabetic key arrangement. Before the first commercial typewriter was sold, however, the alphabetic arrangement was "improved" and transformed into the QWERTY arrangement. Sholes' reasons for the change are obscure.

The most familiar challenger to QWERTY, one that crawls in a distant second in popularity, is the Dvorak-Dealey letter arrangement, named for its developers August Dvorak and William L. Dealey.

The Dvorak-Dealey keyboard first appeared in the 1936 book *Typewriting*

*Behavior*, authored by the developers of the new letter arrangement. The Dvorak-Dealey philosophy was simple: people type faster when they alternate hands when typing, that is, first a finger of the right hand presses a key, then a finger on the left. To make hand alternation more frequent, the Dvorak-Dealey arrangement put all the vowels in the home row under the left hand's fingertips and the most common consonants in the right hand's home row.

During the 1930s, tests (basically typing races on mechanical typewriters) were conducted to support Dvorak's claims. In those first tests, Dvorak-Dealey pulled ahead as the winner. To hear the Dvorak proponents talk, you'd expect that their favorite beat out QWERTY by at least two or three to one. In fact, the results put Dvorak-Dealey ahead of QWERTY by only about 30 percent.

### Undelivered Promises

An improvement of 30 percent is still significant, of course, but keyboard researcher and consultant Paul Green, Ph.D., assistant research scientist at the University of Michigan Transportation Institute, Human Factors Division, believes that those figures are questionable. From a pure-research standpoint, Green believes there might have been a bit of bias among the early Dvorak-Dealey researchers, since they also happened to be the principal proponents of the revised keyboard design. This fact weakens their study's claim to objectivity.

"If the same person designs something and then tests it, there's always reason to question the findings," notes Green. "By that I don't mean that the findings were necessarily bad; it's just that you'd like to have an independent party perform the tests."

"The difference in typing speed between QWERTY and Dvorak depends on whose study you look at. In some studies you'll find a 5 or 10 percent difference; in others you'll see maybe a 30 percent difference," says Green. "The evidence is

inconclusive. The suggestion is that the Dvorak keyboard may not be as good as claimed."

The principal benefit conferred by the Dvorak-Dealey arrangement, at least theoretically, is that less finger movement is necessary. "But some of the new movement data suggest that the Dvorak keyboard does not provide much of an improvement," Green notes. "A University of California at San Diego study suggests that there is not a big savings in movement time."

### Studying Dvorak

The possible problems with the Dvorak-Dealey studies have not been ignored. "There were two experiments that looked at that problem, one by the General Accounting Office and one by the Navy. Both were conducted many years ago," notes Green. "The problem is that when you read the studies, you cannot figure out what they did. The reports were not well written, and it's an effort to decipher the results. There has been no really clearcut scientific work in the area to this day."

One weakness of many studies of keyboard performance has been that the typists used in the testing may not have been a representative sample of the typing population as a whole. "If you run a typing contest with highly trained people, then the people using the Dvorak tend to type fastest," notes Green. "But that does not represent the performance of the average typist or the average keyboard user."

Furthermore, tests to determine the speed at which typing skills can be acquired on the different keyboards do not necessarily reflect real-life situations. Green believes such experiments may not be particularly relevant to the problem at hand. Many of the experiments simply aimed to see how quickly people without previous training could learn to type on QWERTY and on Dvorak. "But that's not the way the world works," he argues. "There are so many QWERTY keyboards out there that, in most cases, it's more a matter of retraining people to type on Dvo-

rak—a very different problem."

Another of Green's concerns is that the Dvorak-Dealey layout (as well as QWERTY, of course) may already be as obsolete as the mechanical typewriters it was created for. "The Dvorak keyboard was designed for a different kind of typing than we do now," Green notes. "The Dvorak keyboard was designed to type English text. Today, keyboards aren't just used for typing English text. They're used for typing letters, numbers, and special symbols. Therefore, the frequencies in which various characters are used have changed."

"For instance, the Dvorak keyboard did not have a tilde on it, and yet when you use a keyboard to operate a computer you may use the tilde key quite often. The control key is an even better example—look at *WordStar*. The keyboard has changed to suit modern purposes. And I would expect that keyboards will continue to change."

Certainly, hybrids could be created by grafting the necessary additional keys onto the Dvorak-Dealey layout, but that opens a new can of worms. Absolutely no research has been done on the subject, and it could be that Dvorak with function keys is no better than QWERTY with function keys. The simple truth is that no one really knows for sure whether any one arrangement is best. "No one has properly studied the distinction between the QWERTY and Dvorak," says Green. "There have been some studies, but in terms of solid science, you can't say that we've done a good job."

But perhaps the biggest problem with using or adopting the Dvorak-Dealey design is the status quo. The established QWERTY user base is huge, and the equipment base is just as overwhelming. Although the Dvorak-Dealey design may offer a theoretical performance advantage, the practical efficiency of giving up the current QWERTY standard is at best doubtful.

Green concludes that "the Dvorak keyboard confers some theoretical efficiency in terms of finger movement, but that's

not the critical issue. The critical issue is whether it's worth it to retrain people on the Dvorak."

Donald Gentner, a motor skill researcher at the University of California at San Diego, is more positive about the superiority of the Dvorak-Dealey design but even more skeptical of its chances for general acceptance. "The Dvorak is as good a keyboard layout as you can find. If I could ensure that I would type only on the Dvorak for the rest of my life, then I would go to Dvorak. The personal computer may just make that possible," he says. "But there are too many QWERTY keyboards already in use and too little energy being expended on promoting alternatives for the Dvorak to be adopted."

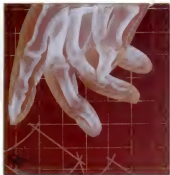
### The Stroke Below

Once you go below the legends on the keys to look at the mechanics of the keys themselves, matters become even more clouded. Whereas the QWERTY-Dvorak controversy has generated some scholarly as well as popular interest, very little has been published about the ergonomics of the keys themselves and their underlying mechanisms.

One reason for this may be that the results that have come out haven't proved particularly interesting. In general, people type on whatever system they have and get better at it with practice. Furthermore, most of the studies that are conducted are done internally by large corporations, and the findings remain proprietary.

Many variables don't seem to have a measurable effect on performance. For instance, Honeywell's experiments with audible feedback, testing clicking keyboards against silent ones, showed that while it may be reassuring to hear your keyboard click to confirm that you've completed each keystroke, the noise isn't likely to help you type faster.

Even the amount of force necessary to activate the key mechanism, which might seem critical, is problematic. Obviously, an extremely high force requirement will prevent a character from ever being typed,



Major keyboard companies are ready, willing, and able to build products to nearly any specification.

## RORSCHACHS FOR KEYBOARDS

Trying to quantify the concept of keyboard "feel" is more difficult than you might think. Every keyboard seems to have a personality all its own. Some take a light touch, others require hammer blows. Some squish like wet boots, others are as springy as a perfectly done cake.

Knowing that words don't do justice to the task of classifying the faint nuances of keyboard feel, PC opted for a graphic presentation: force versus displacement curves. These graphs, drawn from measurements made by Linda L. Foster of Advanced Input Devices, show the resistance offered by a typical keyboard key as it is progressively pressed down.

Your fingertip feels changes in pressure, and a sharp change signals you that the key has been activated.

On the force versus displacement charts is an arrow indicating where contact is made. This activation point was independently measured on the same key-

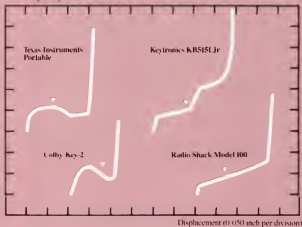
boards by Joseph Gartman of Parameter Electronics in Cleveland, Ohio.

Before this project began, the preferred keyboards were expected to be the ones that most consistently required the same amount of movement to activate each key. Surprise! Both the IBM Selectric and standard PC keyboards turned out to vary the most from key to key, while the unassuming Cherry wireless model was the most consistent. (One reason for the Cherry's consistency could be its construction—each key is a separate, individually replaceable hard-contact switch. Most other keyboards are made as one unified mechanism.)

The wide difference between the key travels of so-called "full-travel" computer keyboards and that measured for Selectric typewriter keys was also surprising. Key travel on the Selectric was nearly 50 percent greater than that of any computer keyboard tested!

### Force Displacement Curves

Force (50 grams per division)

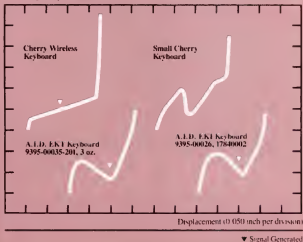


▼ Signal Generated



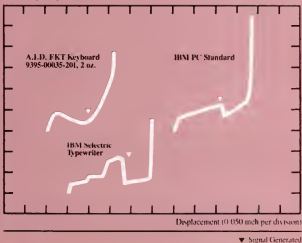
### Force Displacement Curves

Force (50 grams per division)



### Force Displacement Curves

Force (50 grams per division)



and too light a required force will allow the wind to do your typing for you (generally with more than a few errors, though), but experimental results suggest that within a wide range, required key-stroke force is an insignificant factor in typists' performance.

In fact, the IBM Selectric typewriter keyboard, the favorite of many PC-keyboard critics, requires different amounts of force to operate keys in different rows. This is true even of the same key when it is pressed twice in succession, according to Crawford Byxbee, director of engineering at Advanced Input Devices, a company that supplies computer keyboards to IBM. What this means is that a strictly objective force-displacement measurement will always be an elusive goal.

Prejudice is another reason for inconclusive experimental results. The classic computer industry example is the PCjr keyboard. Several sources close to IBM and in the academic community contend that IBM did indeed conduct typing tests on the PCjr keyboard before unleashing it on the world. The results are said to have showed little difference in typing performance between the PCjr's keyboard and keyboards with larger keys. Nevertheless, the public resisted the lure of "Chiclet" keys and complained that it was not a keyboard to be taken seriously, even though the rectangular keys allowed the revolutionary use of keyboard overlays to redefine keyboard legends and tailor them to specific applications software.

### Keyboard Standards

Interviews with representatives of major keyboard companies including Key Tronic, Cherry Electrical Products, and Advanced Input Devices, revealed that the companies are ready, willing, and able to build products to nearly any specification. But although the keyboard builders may make suggestions based on their experience, the final say rests with the computer manufacturer contracting for the keyboards.

Outside of giants such as IBM, which



The most important conclusion we can draw is that there might not be one single best keyboard.

## LADIES AND GENTLEMEN, START YOUR KEYBOARDS

The search for the ultimate keyboard meant comparing keyboard-action data with typing performance tests.

When *PC's* editorial team looked for a standard keyboard—or at least research pointing us toward what an ideal keyboard should be—we found that the answer has yet to be found. Daunted but not ready to give up, we set out to see if we could isolate exactly what ingredients would go into the ultimate keyboard—one that perfectly fits everyone's fingers, one with the best ergonomic design—and to determine which of the currently available keyboards is the best.

Our strategy was to measure the differences among keyboards, and then to try to correlate those differences with typing performance. We decided to base our comparisons on the two current de facto standards. One is the often criticized IBM PC factory original keyboard; the other is the widely praised keyboard of the Selectric typewriter.

As we gathered keyboards from across the country, we found that the challengers fell into three classes. One set, including products from Colby Computer, Display Telecommunications, and Key Tronic, can be bought as direct replacements for your IBM's original equipment. The second set is composed of keyboards included with popular computers, such as the IBM PC, PCjr, Radio Shack TRS-80 Model 100, and the Texas Instruments Professional Computer. The third set consisted of special keyboards with a single altered parameter—keytop shape or keystroke force—so we could assess the effects of changing individual parameters. Crawford Byxbee of Advanced Input Devices in Coeur d'Alene, Idaho, prepared these products exclusively for these tests; in

many cases they are unavailable to you.

### The Procedure

The keyboard action graphs accompanying this article can only describe the differences among a wide variety of products. These graphs cannot rate different feels or declare one the "best." To classify the desirability of different keyboard feels, we had to correlate the measurements with actual typing performance. Accordingly, we arranged a type-off to rate keyboard performance. To avoid predispositions toward any one keyboard, we enlisted the aid of seven competent but fresh keyboarders, students not yet graduated from business school who had been taught to type but had not spent an entire lifetime fondling any particular machine.

To isolate typing performance from word processing, we used the computers as mere keystroke gatherers. Every character typed during the predetermined test period was sent directly to a file. After the completion of the testing, the words in each sample were counted for a gross speed rating, the errors flagged and counted, and a net rate derived. The speeds shown in the accompanying chart combine the averages of all the typists for a single test period. To minimize the effects of fatigue and improvement of typing skills during the tests, each typist tried the various keyboards in a different order, chosen at random.

Three keyboards did not compete in these tests. The Cherry PCjr replacement keyboard would not function with our PCjr and could not be used. The AID large keytop/light force keyboard was both visually, mechanically, and func-

tionally identical to the Display Telecommunications Model and was not tested. Because the Radio Shack Model 100 had a force versus displacement curve identical to that of the Cherry hard contact/wireless keyboard, it was not submitted for testing. Speeds on Selectric typewriters are not given: direct comparisons would be invalid because our typists were trained on such machines.

These test results have an important limitation. The relative rankings of the keyboards apply only to normal text entry. The test results may not correspond to the speeds that you can achieve with these keyboards when you use them for numerical data entry in a spreadsheet accounting, or computer programming.

## Test Results

The results reveal that the Texas Instruments Professional Computer keyboard won the typing race in both raw and net speed. However, the differences among the three net-speed front-runners amounted to just above 1 percent, and although we can't quantify the margin of error of our measurements, we feel safe in rating the contest a tie between the TI, the runner-up Advanced Input Devices large key/high force keyboard, and the third-place standard IBM PC.

The Key Tronic 5151 would have been a strong challenger for top honors (particularly in the raw-speed category), but it (along with its sibling, the 5150) proved to be the keyboard upon which our typists made the most errors. Apparently, the Key Tronic's short throw was the culprit. (To be fair about it, most of the errors were the sort that would probably disappear once typists became accustomed to the keyboard's action.) Only the TI (which also registered a high number of errors) required less travel for activation.

The reason the TI fared very well and the Key Tronic not so well may be that

the feel of the TI keyboard differs substantially. In fact, all of the typists praised the feel of the TI. Most of the typists said the Key Tronic models required too much force, even though they actually require only a light touch. The discrepancy between their impression and the facts may be due to the Key Tronic's lack of any tactile indication of the exact moment the keys activate.

Subjectively, the all-around winner was the standard IBM PC keyboard. Four typists rated it as their favorites, and a fifth typist included it as one of her three favorites. The TI, the Cherry capacitive, and the AID large key/high force keyboard each earned an individual rave. Two of the typists choosing the PC keyboard also listed a runner-up, in one case choosing the Key Tronic 5151 and in the other the Cherry hard contact/wireless model.

The losers were easier to zero in on. The worst performance, both in gross and net speed ratings, was turned in on the original PCjr keyboard. Runner-up for last place was the AID small keytop, which differs from the PCjr keyboard slightly in keytop shape and key arrangement. Three typists did their worst with the PCjr keyboard, and two fared worst with the AID small keytop. Because the only two keyboards with small keytops consistently turned in the lowest ratings, we can safely conclude that reduced keytop size does cut typing performance.

On the other hand, the PCjr mechanism itself—which is used in all of the Advanced Input Devices keyboards tested here—helped keep the number of errors down, particularly when coupled with full-size keys. In fact, the AID large key/high force keyboard proved best in keeping errors to a minimum.

## Conclusions

These tests suggest several conclusions. The most apparent is that

reduced-size keytops measurably slow typing performance. When we tested the Advanced Input Devices Ergokey mechanism with normal-size keytops, the result was a very fast keyboard. When an identical mechanism—the same feel and force—was tested with reduced-size keytops, it proved to be among the worst performers.

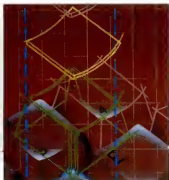
Some kind of tactile feedback is apparently desirable—all three of the winning keyboards give some form of tactile feel. The feel of all three earned almost unanimous praise from the typists. However, feel does not seem to be as important as keytop size—the two slowest keyboards also produced good tactile feedback.

Audible feedback apparently is not necessary. Only once in the subjective evaluations did the testers comment on the sound of a keyboard, and in that case the response was negative.

Keystroke force turned out to be perplexing. One of the hardest-to-press keyboards proved to be one of the fastest, notwithstanding the typists' negative comments about the amount of force required to use it.

Probably the most important conclusion we can draw is that there might not be one single best keyboard. The three fastest keyboards differ substantially in their measured characteristics. Although all three give the typist some degree of tactile feedback, their force versus displacement curves are quite different. Also, the amount of keystroke travel seems to be independent of speed—the fastest keyboards covered the entire range we tested.

The most unexpected result may be the overwhelming subjective preference for the standard IBM PC keyboard. Although computer users may deplore it, when we hid the manufacturers' names under numerical labels, typists overwhelmingly preferred IBM. —W.L.R.



Other factors besides ergonomics can also greatly influence the design of keyboards.

## KEYBOARD ERGONOMICS

Keyboard	Gross Speed	Errors	Net Speed	Key-stroke Force, nominal
Key Tronic 5150	916	114	802	1.75 49
Key Tronic 5151	1,023	127	896	1.79 50
Cherry Wireless	961	73	888	1.75 49
Cherry Junior	—	—	—	—
Cherry OEM	940	104	836	1.75 99
Radio Shack TRS-80 Model 100	—	—	—	1.29 36
Texas Instruments Professional Computer	1,036	92	946	2.25 63
Colby Key 2	965	87	874	2.32 65
IBM PC, standard	993	67	926	2.46 69
IBM PCjr, former	837	74	763	3.07 86
Display Telecommunications	949	61	888	1.64 46
AID, 2-oz large key*	—	—	—	1.64 46
AID, 3-oz large key	982	46	936	3.07 86
AID, 3-oz small key	885	87	798	3.07 86
IBM Selectric typewriter	—	—	—	2.89 81

Key travel at actuation (in.)							
Median	Measured Range	Audible Feedback	Keytop Size	Number of Keys	Dimensions (inches)	Weight (pounds)	Price
0.071	0.012	No	Full	84	17.75 × 7.63 × 1.5	4.5	\$209
0.071	0.011	No	Full	99	20.25 × 8.75 × 1.5	6	\$255
0.084	0.001	No	Full	84	17.75 × 7.75 × 1.5	3.5	\$275
—	—	No	Full	62	14 × 7.75 × 1.5	2.5	Prototype
0.087	0.005	No	Full	84	17.75 × 7.75 × 1.5	3.25	\$199
0.070	0.007	No	Full, with small function keys.	56 large 16 small	11.75 × 8.25 × 2 (above figures for whole computer)	3.75	Available only with a computer.
0.065	0.005	No	Full	97	18.75 × 8.25 × 1.5 (portable model)	4.75	Available only with a computer.
0.082	0.005	Yes	Full	84	15 × 7.5 × 2 (1.5 to keytop)	3.25	\$260
0.101	0.016	Yes	Full	83	18 × 7.5 × 1.5	6	\$243
0.102	0.004	No	Small	62	13.5 × 6.75 × 1.125	1.5 (w/cord, no batteries)	\$97.25
0.100	0.013	No	Full	84	17.5 × 7.5 × 1.5	2.5	\$149.95
0.101	0.017	No	Full	84	17.5 × 7.5 × 1.5	2.5	OEM only
0.103	0.003	No	Full	84	17.5 × 7.5 × 1.5	2.5	OEM only
0.102	0.005	No	Small	84	17.5 × 7.5 × 1.5	2.5	OEM only
0.144	0.028	Yes	Full	56	20.5 × 15.75 × 8 (4" to upper keytops)	28.5	\$998, including typewriter.

### STANDALONE-KEYBOARD COMPANIES

These four manufacturers specialize in keyboards.

#### Advanced Input Devices

West 250 AID Dr.  
Coeur d'Alene, ID 83814  
(208) 765-8000

#### Cherry Electrical Products Corporation

3600 Sunset Ave.  
Waukegan, IL 60087  
(312) 662-9200

#### Colby Computer

849 Independence Ave.  
Mountain View, CA 94043  
(415) 968-1410

#### Key Tronic Corporation

P.O. Box 14687  
Spokane, WA 99214  
(800) 262-6006

can afford its own on-going ergonomic research programs, computer companies generally seek guidance for those specifications from whatever sources may be available, primarily the various industry standards. The most widespread keyboard standard is the DIN (Deutsche Industrie Normen, or "German Industry Standard").

The aim of the DIN regulations is to increase the typist's comfort and reduce fatigue, not to increase typing performance, although, of course, these factors may be interrelated. Thus, DIN's treatment of ergonomic standards for keyboards is minimal, concentrating on gross physical factors. A keyboard can conform to DIN standards by meeting just three requirements: (1) The keyboard and video display must be separate and the keyboard must have slide stops to prevent it from moving on the work surface; (2) the height from keytop (in the middle key row) to the tabletop must not exceed 30 millimeters and the keyboard must be angled less than 15 degrees from the horizontal; (3) the keyboard and its cover must have a half-matte to silky-matte finish with a reflection value between 15 and 75 percent. (It cannot be too bright or too dark.) Dark legends on light keytops are preferred.

When the first complaints came in from the field about the arrangement of keys on the original IBM PC keyboard—specifically, the small Enter key and the unusu-

ally placed Shift and backslash keys—the design was justified as conforming to a European standard. The PC keyboard does indeed conform to the DIN standard—it has dark legends on light keytops, a 30-millimeter profile, and it's detached from the CPU.

Although the DIN regulations may seem like a step in the right direction, they are not based on extensive human factor studies. "There's no research support for the 30-millimeter height standard. It just doesn't make any sense," says Green. The keyboard height standard is based on another DIN standard that specifies a non-adjustable desktop height of 720 millimeters and a keytop to floor distance of 750 millimeters. Should a work surface be lower—and most typing stands in the United States are at least 2 inches lower than that—then a consistent interpretation of the DIN standard would require a much thicker keyboard!

#### Other Key Concerns

The PC keyboard's arrangement of function keys also catches plenty of flak.

"There's no data on function keys," says Green, but "there is a general principle that controls and displays should be compatible. That means that if you have a horizontal row of labels, the keys should also be arranged horizontally. But there is no performance data that answers the

question of whether it actually makes any difference."

Even the accepted arrangement of columns of keys is subject to debate. A standard keyboard offsets keys instead of stacking them in straight columns. This arrangement has carried over from the days of mechanical typewriters operated by levers. Back then, the keys had to be offset for the rows to fit together and work. Computer keyboards require no mechanical connections, and thus need no such circumlocutions.

"There are some real problems with offset columns," notes Gentner. "While typing some right-hand key pairs, such as K-L, is easy, some left-hand combinations, such as D-R, require an unusual twist of the fingers. A minor change in this part of the key layout could greatly improve typing comfort."

There is no scripture that requires keyboards to be flat, either. In fact, most place keys at various heights and angles to align vertical columns of keytops in a gentle arc. In theory, this arc puts keys closer to the typists' fingertips, resulting in less finger motion and more efficient typing.

#### Other Factors

Other factors besides ergonomics can also greatly influence the design of keyboards. For example, it's generally—though never specifically—acknowledged that the PC's keyboard was chosen because it was sitting on the shelf when development time was running short. Detractors of this keyboard might be surprised to learn that it may very well be a descendant of an early version of the Displaywriter word processing system. Apparently, only its case was changed from its previous incarnation.

Perhaps a bigger surprise for those who complain about the PC's keys and long for the keyboard of the good old Selectric, is that the latest versions of IBM electronic typewriters now use the PC's keyboard. IBM has finally made the PC's keyboard just like the Selectric's—but not in the way that everyone wanted. ■

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# 1.2.3

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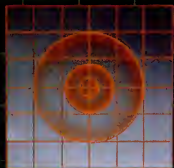
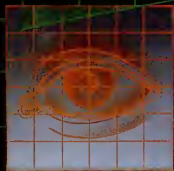
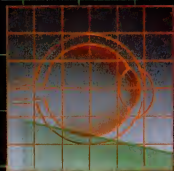
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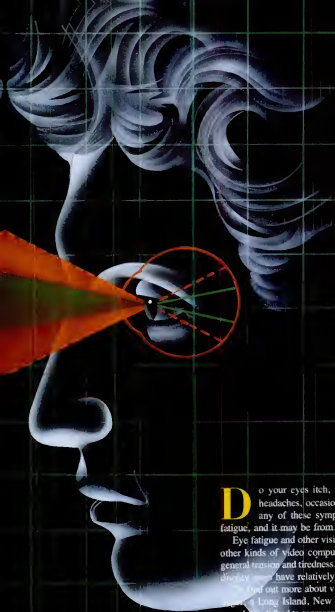


COVER STORY • JOHN DICKINSON

# STRAINING TO SEE THE SCREEN

Spending too much time staring at your PC's little green letters may be giving you headaches and double vision. PC asked some eye specialists how to avoid video eyestrain.





**D**o your eyes itch, burn, or tear? Are they tired and sore? Do you get headaches, occasional dizziness, or blurred or double vision? If you have any of these symptoms, you're probably suffering from eyestrain and fatigue, and it may be from using your PC.

Eye fatigue and other vision problems are common for regular users of PCs and other kinds of video computer displays. This visual stress can also contribute to general tension and tiredness. Fortunately, the vision problems experienced by video display users have relatively simple causes and equally simple solutions.

To find out more about vision problems and video displays, I consulted Bonnie Berman, a Long Island, New York, optometrist who specializes in industrial vision care. I also talked to representatives of the American Optometric Association (AOA) in St. Louis, Missouri, and obtained additional information from members of the New York Committee for Occupational Safety and Health (NYCOSH), an independent coalition of unions and health care professionals.

Everyone I consulted stated that video display users often have vision problems and agreed about most of the causes and cures. They said that how and where you use your video display contribute more to vision problems than the type of display you have or the fact that you're using one in the first place.

Basically, your eyes react poorly to a video display because of the way nature designed them. Eyes function best when they look at objects an arm's length or more away. When you look at something closer than that, like your PC's display or even a



A display that's dim compared with ambient room light will cause you to squint as you try to decipher what's on the screen.

book, your eyes are forced to turn inward toward your nose, to bring what you're looking at into proper perspective. At the same time, your lens muscles contract to maintain the correct focus for nearby objects.

Shifting your eyes from one nearby object to another causes additional strain. Not only must your eyes move, they also must change perspective and focus. The extra strain isn't too bad when you simply move your eyes from one area of the screen to another because both areas are the same distance away. But when you look over at something at another distance, like a document lying flat on your desk, your eyes must change focus, which causes additional strain.

Screen glare, the brightness of the display itself, and too much ambient room lighting can aggravate eye fatigue further. Glare from light sources at the side or back of the screen causes your irises to contract and your eyes to squint as you look at the screen, which reduces the amount of light that enters your eyes. A display that's dim compared with ambient room light will also cause you to squint as you try to decipher what's on the screen.

Poor image quality also contributes to eye fatigue. A fuzzy or constantly flickering image will make your eyes work hard as they try to focus on it (sometimes an impossible task if the screen is especially fuzzy). Most PCs are equipped with high-quality video displays whose image definition, density, and contrast is adequate, and most screen drivers used in PCs have image refresh frequencies that eliminate the type of constant flicker that causes fatigue.

However, not all PC users have good monitors. Older-model displays used on some PCs and video terminals are not as clear, and AOA representatives say that using a television set for a display causes the most severe problems. Problems with eyestrain will be even worse if you use an older-model television set, according to the AOA, because they usually have worn phosphors and employ an out-of-date,

less-accurate focusing technology.

Similar eyestrain can result when you read magazines or books or watch ordinary television, especially at close range. However, the problem seems more severe and widespread among video display users. Why is the problem more acute when you use a video display? According to Dr. Sager, people tend to look at video computer displays longer than they do a printed page or television set, because they have work to get done or simply because they are fascinated by the machine.

"Their eye muscles aren't accustomed to the strain," she says, "and putting someone to work in front of a video display is a little like asking an untrained person to run a mile." Sager reports that eye muscles can be trained to take on a heavier load than they're used to, just as you can train the other muscles in your body. "But visual training may be impractical for video display users because of the time and expense involved," she adds.

### Eyestrain Preventers

What can you do if you can't train your eyes? Among the simplest and most effective things you can do to avoid eyestrain is rest your eyes occasionally. Sager suggests taking a 15-minute break away from the screen every hour or two. The National Institute of Occupational Safety and Health (NIOSH) also recommends taking a 15-minute "alternative task" break after 2 hours of video display use. NYCOSH adds that you should try to take these rest periods in open areas so you can focus your eyes on more distant objects and possibly do some simple body and eye exercises.

Another simple thing you can do to avoid eyestrain includes positioning yourself, your PC, and your other work materials correctly. AOA officials recommend that the display (and you) be positioned so that the top of the screen is about 10 degrees below your eye level. The center of the screen should be about 20 degrees below eye level, and between 14 and 20

inches away. Sager believes that 24 inches away may be close enough. The AOA officials suggest that you use an adjustable chair so you can make sure your eyes are at the right height in front of the screen.

If you're working with source or reference documents, they should be placed vertically and as close to the screen as possible to allow your eyes to maintain the same focal distance and perspective. Sager suggests a simple and inexpensive way to do this: "Use an ordinary steno stand," she says. "It holds the material at about the same distance away from you and height as the display does. Never put the material flat on your desk and try to read from it when using a display," she warns.

Correctly lighting your work area is another measure to prevent eyestrain, but this can be difficult to implement in some offices. The AOA recommends a lighting

level of about 30 to 50 foot-candles, less than is customary in offices. In most offices, you'd have to reduce the level of light to that by removing some overhead fluorescent bulbs or changing them to ones with lower brightness ratings because few offices are equipped with light-dimming switches.

Sager recommends soft ambient lighting, supplemented by brighter "task" lighting. "A small lamp, like a Tensor, located above or on top of the display is helpful," she says.

The display's brightness must also be adequate to maintain the contrast between the screen and the room's surrounding light. If the display isn't bright enough, it will be "washed out" by room light and be difficult to see. The AOA recommends that screen brightness be set at about three or four times the level of room lighting. But don't make the screen so bright that you get image retention. "You don't want little green characters dancing around in your head when you're done for the day," warns Sager.

### Glare

Screen glare, another lighting problem, can be reduced by several means. The simplest is to avoid placing the display near a sunny window because light from the window will invariably cause glare. If you can't move the display away from a window, use shades or drapes to reduce glare. A way of moving the display to avoid glare is to mount it on an accessory tilt/swivel stand. Some newer displays have a tilt/swivel base built into them, and swinging arm mounts can be used for the same purpose.

Another antiglare measure is to avoid wearing white or light-colored clothing if it causes a reflection on the screen. The AOA also suggests covering the surface below and in front of the screen with a dark, nonreflective material if no other glare remedies are workable.

Screen glare can also be reduced by using shades that hang over the top of the video display. Antiglare mesh screens that

cover the display also reduce glare and can be purchased to fit on almost any model you are using. Some video displays come equipped with their own built-in antiglare screens.

Few simple measures can improve poor image quality, another contributor to eyestrain, short of changing to another monitor. Since image quality is generally good on most video displays bought for PCs, however, there's probably not much to be gained by changing models unless yours is a very old one. When shown the same text on color and monochrome screens, Sager preferred the better definition of the monochrome, but thought that the resolution of the color display was adequate. Asked about the supposed advantages of amber screens over green ones, she would only say, "Choose the color that you feel is most comfortable for your eyes."

### Video Eyeglasses

Whether you like it or not, you may need corrective eyeglasses to get adequate relief from eyestrain. The AOA points out that even though your eyes don't ordinarily need correction, you may need glasses for using your PC's video display. If you wear glasses, you may need a different lens prescription from the one you ordinarily use.

Some observers believe that video displays cause some of the vision problems that require correction. The AOA notes that optometrists have found that visual stress can sometimes contribute to the development of nearsightedness or other vision problems.

Nevertheless, according to Sager, "Many people simply don't realize that they have vision problems until they use a video display. They've never done that type of concentrated viewing at close range before."

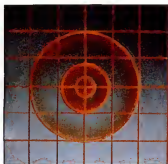
Regardless of cause and effect, it's a good idea for you to have an eye examination if you use your PC a lot. Make sure that your optometrist knows that you normally use a video display and how you use

## INFORMATION SOURCES

If you are having eyestrain problems, you should consult your ophthalmologist or optometrist. AOA and NYCOSH also offer brochures on the subject for a small fee.

•Send 25 cents (in coin) to:  
American Optometric Association  
Communications Division  
243 N. Lindbergh Blvd.  
St. Louis, MO 63141

•Send \$1.50 (individuals or unions) or \$3.50 (companies) to:  
New York Committee for  
Occupational Safety and Health  
32 Union Square, Room 404  
New York, NY 10003



Working at a video display screen with improper illumination often brings on symptoms of fatigue.

## A WELL-LIGHTED WORKPLACE

Improper lighting can come between you and your PC, but careful, knowledgeable planning can brighten the picture considerably.

**Y**ou and your PC are a team. Together, you are able to do more work in less time and with less effort. You don't know what you would do without it. Lately, though, after spending a while at the computer, you've noticed your eyes have felt strained, you've developed headaches, and fatigue has set in.

What's wrong? It could be your room lighting. Working at a video display screen with improper illumination often brings on these, and other, irritating symptoms of eyestrain and overall fatigue. Fortunately, as Dr. Aran Safir, chief of ophthalmology at the University of Connecticut School of Medicine, stresses, "the wrong lighting isn't a question of harm; it's only a question of comfort."

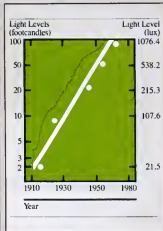
A computer display's cathode-ray tube both emits and reflects light, so proper illumination of the computer workplace requires a difficult combination of sources and types of light. The problem is creating as comfortable an environment as possible. The installation of flexible lighting with easily controllable direction and intensity is the best solution. And while the goals are similar, the lighting techniques and devices used for computing at home differ slightly from those applied in the commercial workplace.

In both home and office settings, a primary aim is to evenly match the amount of light falling on the screen, on the keyboard, and on documents or other paperwork—the three areas to which your eyes must continually shift. At the same time, however, it's important to illuminate your entire field of vision,

since the sharp contrast of a lighted desk surrounded by darkness can strain eyes. This means establishing a fairly high level of task lighting for the close-in area of your desk and a low level of ambient illumination to brighten the remaining area around you.

### Glare

The biggest obstacle to comfortable lighting is the glare generated when lights or shiny surfaces reflect off the screen into your eyes. Glare also results from too much ambient light, transmitted through windows, for example. Glare reduces screen contrast, making the characters difficult to read, which can often lead to errors.



Recommended light levels for office visual tasks have risen steadily during this century. This is probably because each generation has grown up with more ambient light.

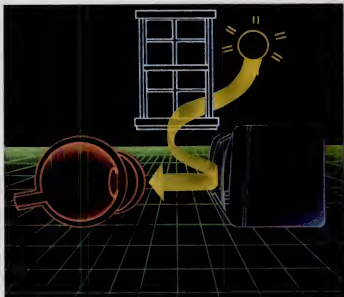


Unfortunately, notes Richard Koffler, the Santa Monica, California, publisher of *The Office Systems Ergonomics Report*, "planning a well-illuminated task area while simultaneously trying to eliminate glare are two objectives that tend to work against each other."

Nonetheless, each must be addressed separately. To help prevent glare, you should use a task lamp that can be manipulated to shine on your keyboard and papers—not on the screen. An architect's arm lamp is just right. Both its head, containing the bulb, and the long, flexible arm, to which the head is attached, can be maneuvered to direct light precisely where you want it. Basic models can be purchased for around \$15, and the lamps are available at electrical supply outlets, houseware retailers, department stores, art shops, and office suppliers. Architects' lamps designed specially for offices are generally sturdier and less decorative than those targeted for home use.

There are two variations of this lamp that lighting experts particularly recommend for computer work. One is a combination model using a 60-watt incandescent bulb in the center of a 22-watt fluorescent ring. Both sources can be turned on together for a daylight effect, and each may be used separately. The other recommended variety provides asymmetric lighting. Designed specifically for CRT work, it reduces glare by directing its beam across the desk at a slant, rather than straight down. This way, the shade remains parallel to the desk while the light is cast obliquely.

Other styles of task lamps can also provide comfortable lighting as long as they are sufficiently adjustable and have the right kind of shade. In order to min-



imize glare, the shade should be opaque with a matte finish. Shiny surfaces, such as brass, are unsuitable because they produce glare.

Appropriate task lamps are available in both incandescent and fluorescent versions. While the best type is a matter of personal preference, fluorescent lights typically cast a more diffuse, softer light than an incandescent lamp, which can create harsh shadows. And the new generation of mini-fluorescent bulbs, some made to last for up to 10,000 hours, produces more natural color than previous types. Further, fluorescent bulbs use less energy than incandescent bulbs to throw the same amount of light.

On the other hand, many people prefer the warmer glow of incandescent

lighting, and some are sensitive to a fluorescent lamp's flickering. Unlike fluorescent lights, incandescent lamps are compatible with dimmers to control the light level.

### Placement

Placement of the task lamp is critical. Never position it over your shoulder, because the light will then fall directly onto the screen. The ideal spot is somewhere on the same side of your desk as your paperwork. To save surface space, many architect's lights come with a clamp for easy attachment to the edge of the desk.

Some wall-mounted lamps can also supply proper computer workplace lighting. While they usually can't be adjusted



If you already wear corrective lenses, you may not have the right prescription for video displays.

to the extent an architect's arm lamp can be, many are available on swing arms with heads that swivel and tilt. With these, it's important to make certain that the lamp is mounted low enough over the desk so that the exposed bulb can't be seen while you're looking at the computer's display.

Another method of illuminating the task area is to install track lighting on the ceiling above your PC. The individual spotlights on the track can be positioned to throw light exactly where it's needed. Use either direct illumination or bounce the light off the wall behind the computer. A 4-foot-long track and two spotlights can be purchased for under \$100.

When it comes to lighting the ambient space around your home workplace, strive for generalized, subdued lighting. Again, you want to avoid the discomfort that can stem from such extremes as a well-lighted desk in an otherwise dark room and an overall environment that's too bright.

One lamp you should consider buying is a floor lamp known as the torchier, priced from around \$60. It averts glare by directing light toward the ceiling so it falls softly around you. Another good indirect uplight is the "can" light, which has traditionally come in handy for spotlighting plants.

### Business Lighting

In open business offices, conventional fluorescent ceiling lights are a major cause of screen glare. You can avoid this situation by using recessed fixtures designed to minimize surface brightness and to diffuse light. Large-cell, open parabolic louvre "downlights" are highly recommended.

These fluorescent ceiling lights resemble a honeycomb and use a louvre with slightly curved sides that direct light downward. A parabolic fixture that can be suspended on a track directly above

the computer workplace is particularly convenient. Stick to the easily disconnected plug-in variety so you can shift the fixture to another spot if, for some reason, the PC must be relocated.

As a rule-of-thumb for lighting the workplace in an open office area where there are several workers, James L. Nuckolls, a lighting designer with Incorporated Consultants, Ltd., in New York, advises: "Design for a flexible standard; then modify for the individual."

### Executive Decisions

In the executive office, comfortable, glare-free lighting may be slightly more difficult to arrange. "The private office is typically designed for other uses, such as meetings and conversation," notes Lawrence Lerner, chairman of Environmental International, Inc., interior architects with offices in New York and Los Angeles. "Consequently, [managers] are reluctant to light it with the computer as a primary consideration."

Lerner suggests using incandescent track lighting with rotating heads. Small, flexible-head table lamps can also provide good task illumination while maintaining executive-office tone and decor.

Beyond artificial lighting, remember to factor in daylight. To avert glare, neither you nor the computer should face the window; so place the computer perpendicular to it. Windows should be covered with horizontal Venetian blinds rather than drapes. Blinds will not only inhibit light, but when slats are correctly turned, will redirect sunshine upward to light the area without harshness.

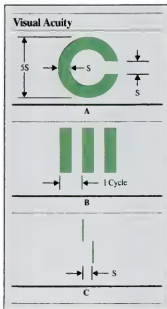
Creating proper lighting conditions may involve a bit of trial and error as well as careful planning. But it pays off in more comfortable computing, so it is time well invested. —Jane Wollman

*Jane Wollman is a New York-based freelance author, writing a book for McGraw-Hill on the ergonomically designed computer workplace.*

it. Check your working environment before seeing the doctor. The AOA suggests that you carefully measure the distance from your eyes to the screen and give this information to your doctor so that the correct lenses will be prescribed.

NYCOSH, NIOSH, the AOA, and others recommend annual eye checkups. A few companies (Ziff-Davis, for one) offer them free of charge for employees who use video displays, and some office unions have negotiated company-paid annual eye examinations for their workers who use video displays on the job. A bill is pending before the California State Legislature that would mandate free eye exams for video display operators. Similar legislation has been proposed in New York and other states, and some states, such as Connecticut, have passed study bills to look into possible laws affecting vision care for video display users.

What will the optometrist be checking



These three symbols are used to test the visual acuity of the human eye.

for? One typical problem apparently more acute for video display users than others is presbyopia, a fancy name for the reading difficulties people encounter as they get older (it usually becomes noticeable when you reach 35 or 40 years of age). Other problems that may be more acute for video display users are near- and farsightedness, astigmatism, and other maladies that affect the shape of your eyes' lenses and cause visual distortion. Poor eye coordination may cause double vision when looking at a video display; many cases can be corrected with prism lenses.

If you already wear corrective lenses, you may not have the right prescription for video displays. Reading lenses are probably corrected for 16 inches, the distance the optical industry considers standard for reading. However, if you're using a video display, the correct viewing distance is between 16 and 24 inches (if your display is correctly located), and your reading lenses won't work properly unless you put your eyes closer to the screen than that.

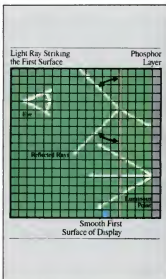
"Looking too closely can cause extra eyestrain and will usually aggravate any posture or back problems you may have," says Sager.

### Bifocals and Contacts

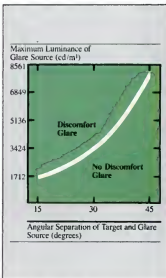
Bifocal and trifocal wearers have particular problems using video displays and should definitely see an optometrist. The AOA believes that optometrists can correctly prescribe multiple lenses for video display users if careful measurements of the conditions of the working environment are taken.

Sager disagrees. "You're much better off with a single-vision lens that corrects for video display use across its entire surface," she says.

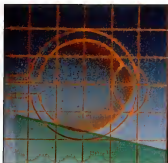
Multiple lenses can aggravate eye fatigue because the eye has to constantly adjust from looking through the lower (reading) lens to looking through the upper lens, according to Sager. Viewing source material may require use of the lower lens, and even the most practiced touch-typists occasionally look through the lower lenses



The diagram above shows the best relation between screen and eye to reduce overhead glare.



Brightness levels above the curve produce visual discomfort.



Video display users should use eyeglasses with an ultraviolet filter to screen out rays.

to check the keyboard. She suggests that people who insist on bifocals try the "invisible line" models because the focus break isn't as severe. "Trifocals," she adds, "are just out of the question for video display users."

What about contact lenses? Most optometrists and ophthalmologists suggest that you don't use soft contact lenses for reading or any other type of close work, including using video displays. Many wearers disagree. They say their visual perspective is so improved with the contacts that they never take them off when working on their PCs.

"Contacts may aggravate itching and burning when worn for video display use because close work reduces the eyes' blink rate," says Sager. She suggests that artificial tears may be of some temporary help but would prefer to see video display users wear regular glasses when working at their screens.

In addition to all these eyestrain causes, do radiation emissions from video displays contribute to vision problems? Not much concrete evidence about the danger to your eyes is available.

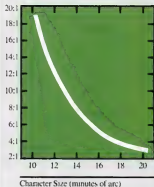
"Forty years of television experience hasn't really shown us what to worry about," says Sager. "We know that low levels of electromagnetic radiation and ultraviolet light are emitted from video displays, but we don't know if they're dangerous or not."

NYCOSH officials think that radiation, ultraviolet light, and microwaves might be a problem. They say more research is needed before conclusive results will be available, but note that the rest and alternative-task breaks suggested for relieving ordinary eyestrain would reduce whatever potential danger exists.

#### Coated Lenses

According to Sager, medical researchers suspect that ultraviolet light is a leading cause of cataracts and retinal damage. Although nothing is proven, she suggests that video display users use eyeglasses with an ultraviolet filter to screen out rays.

Contrast Ratio



The graph above shows that as contrast improves, smaller characters become easier to read.

"They're inexpensive, and may be a good preventive measure." Your current eyeglasses can often be coated with such a filter by a qualified optician or optometrist.

One company is offering noncorrective glasses that have a lens called Eye Care CR-39. Pacific Trade of Emeryville, California, claims to have developed the lenses especially for video display operators.

I obtained a pair of the glasses, which cost \$39.95, and had Sager check them out. She found that they were ordinary nonprescription optical-quality plastic lenses with a bluish-gray tint that is, she says, too dark for any indoor use, including viewing a video display. The lenses in Pacific Trade's glassing have no protective coatings. "You might as well buy a pair of optical-quality sunglasses in a drugstore," Sager says. "They won't help you when using a video display either, but they're a lot less expensive." ■

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# SEEKING A PERFECT CHAIR



Office workers are a chair-bound lot, and personal computers are making them more sedentary than ever. Ergonomic chairs may be a key to comfort and productivity.



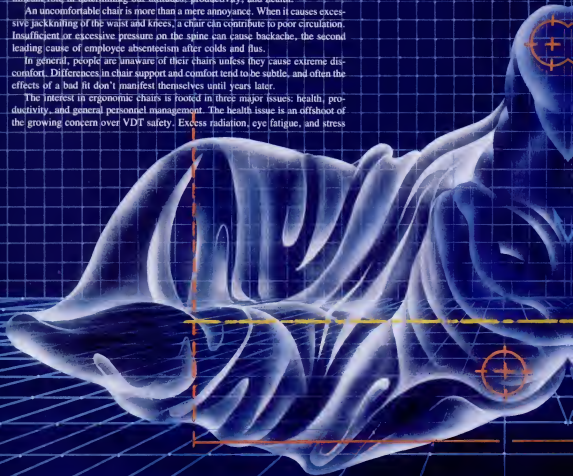
**T**ypical office workers spend more time in their chairs than in any other piece of furniture except their own beds. As a result of expanding communications technology, workers no longer have to run around to accomplish their tasks. And with improvements in electronic accessing and distribution of data, we can expect to be even more bound to our chairs in the future.

Chairs do much more than just support us. They define, to a large degree, our physical comfort as we work. Recent studies conclude that comfort plays a significant role in determining our attitudes, productivity, and health.

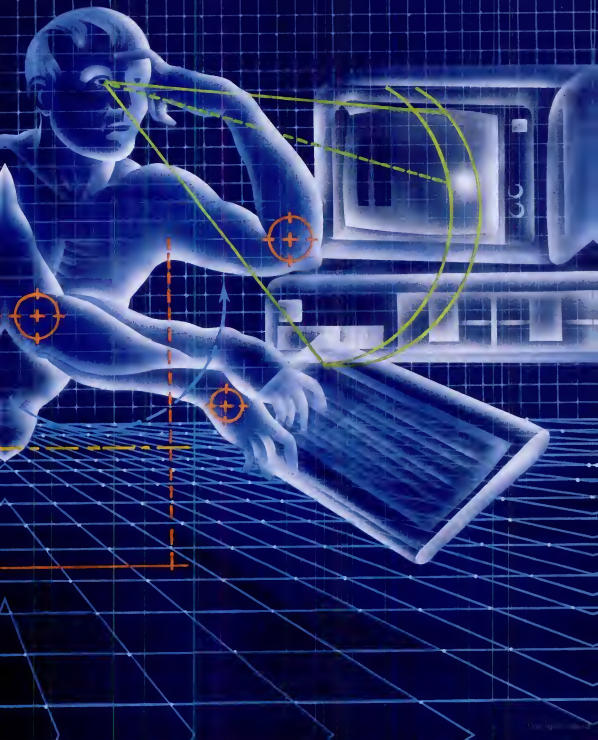
An uncomfortable chair is more than a mere annoyance. When it causes excessive jackknifing of the waist and knees, a chair can contribute to poor circulation. Insufficient or excessive pressure on the spine can cause backache, the second leading cause of employee absenteeism after colds and flus.

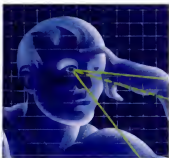
In general, people are unaware of their chairs unless they cause extreme discomfort. Differences in chair support and comfort tend to be subtle, and often the effects of a bad fit don't manifest themselves until years later.

The interest in ergonomic chairs is rooted in three major issues: health, productivity, and general personnel management. The health issue is an offshoot of the growing concern over VDT safety. Excess radiation, eye fatigue, and stress









Office workers are captive consumers who must take what they're given regardless of their size, shape, or task.

have combined to cast doubt on the safety of electronic workstations. While no one would cite chairs as the cause of genetic aberrations, they do contribute to bodily aches and pains, most noticeably in the lower back. Orthopedic specialists cite extreme cases in which spinal damage has occurred.

### A Health Hazard

Alton Ochsner, a leading surgeon and developer of the operation used to remove Richard Nixon's blood clots, claims that thrombophlebitis (blood clots in the veins) is an occupational hazard of sedentary work. According to Ochsner, chairs that restrict blood flow to the legs can contribute to the onset of this disease. A 1981 report by the Working Women's Education Fund stated, "Poorly designed office chairs and constant sitting contribute to muscle and spinal column tension, leading to lower back pain commonly cited by office workers." A Louis Harris poll conducted for Steelcase, a leading office-furniture vendor, reported that 54 percent of office workers said that comfortable chairs were critical to their performance.

The major office-furniture manufacturers claim that the new crop of ergonomic chairs offer better support and more comfort. This, they say, translates into productivity gains both from better work performance and reduced absenteeism. To substantiate their claims the vendors cite studies and surveys conducted by their own research departments and by independent testing organizations.

These productivity measurements are often done in controlled environments, rather than actual office environments. "If you gave one of our ergonomic chairs to a VDT worker to replace the stack of phone books she had been sitting on, I guarantee you that you'd see substantial work improvement," says a product manager for a major office-furniture vendor. "But while we firmly believe that new designs do improve work performance, it is difficult to prove conclusively."

A less financially oriented approach to

the advantages of the new line of chairs appeals to common sense and general good management instincts. Ergonomic chairs are suitable for a wider range of people than older models. They are specifically designed for the new electronic office, improve support to key body areas, and eliminate many of the seating problems cited by workers. A good chair is an investment in the most valuable asset any company has—its people.

Although an "ergonomically designed" chair can mean any seating device designed for people, several features have become associated with ergonomic as opposed to traditional chair designs. One is adjustability. The typical office chair will have to accommodate many different workers during the course of its life, each of whom will need it to support him as he shifts positions to perform a variety of tasks throughout the work day. A chair should also, of course, offer support and comfort.

### If the Chair Fits . . .

"A comfortable shoe and a comfortable chair have much in common," says Bill Stumpf, an industrial designer for Herman Miller. "But, when you buy shoes you can select what's most suitable for yourself from a large stock, while office workers are captive consumers who must take what they're given regardless of their size, shape, or task." Since chair vendors, unlike clothing manufacturers, cannot offer 20 plus sizes, they historically have designed their products for the non-existent "average" person. Of course, everyone is somewhat "off-spec" for that chair.

Even if a chair is custom-fitted for an individual, the postures and positions that person assumes during the course of a normal day vary greatly. Stumpf identified three fundamental postures: work/intensive, conversation/reflective, and relaxation/stretching. In the work/intensive position, the individual is deeply involved in concentrated activities such as typing, writing, or drawing. The body leans for-

ward; the buttocks may not be fully seated in the chair.

Conversation/reflective positions occur during telephoning, reading, and thinking. Although the torso stays relatively motionless, the arms and legs are in constant motion. Finally, when individuals need a break they assume the relaxation/stretching position, sitting way back in their chairs and stretching their arms and legs as if to reverse muscle atrophy. Physiologically, the relaxation/stretching mode is the body's natural way of stimulating circulation. This position is typified by the "feet-on-the-desk" image. Stumpf realized that each of these postures is natural and needs support.

Today's electronic office environment exacerbates the problem of finding a comfortable chair even further. Most VDTs and keyboards are at a fixed height, so the positions assumed during the work/intensive mode are constrained. Also, the individual must shift between writing at a desk, using a keyboard, and viewing a screen, each of which requires a different height or angle, often in the course of a single hour.

### Adjustability

The solution to this Electronic Age dilemma is, of course, adjustability. At the very least, modern, ergonomic chairs should have the capability to adjust height and back support to accommodate a range of sizes. The best height adjustment devices involve a gas-cylinder operation that allows the seated user to lower the seat with the touch of a button or lever, or to raise it to a more comfortable level by standing slightly while pressing a button. Likewise, the back adjustment should provide lower lumbar support whether the person is sitting upright, bending forward, or reclining.

This backrest adjustability can be implemented in several ways. Some chairs employ a tension backrest on a spring hinge. Unoccupied and viewed from the side, these chairs are at a 90-degree or smaller angle. The advantage of this

design is that the seat automatically applies even pressure on the back no matter what the position. The actual degree of tension may be adjusted on some models. The second method employs a bucket-seat-type mechanism that allows the user

to lock the backrest at a particular angle with a convenient locking button.

The most flexible chairs go beyond these two standard features. For example, backrests may be lowered or raised to position the padding exactly at the lower

## THE KOFFLER APPROACH

According to a leading ergonomics expert, complex problems aren't always solved by high-tech answers.

**Y**ou might expect the leading office ergonomics expert to continually sound alarms on health and safety issues relative to today's electronic office. But if you did, you'd find what Richard Koffler has to say pretty surprising. On VDT health issues: "We find that VDT work is no different from any other type of close-up work such as reading." On the alleged benefits of amber screens: "Many studies have shown that there is no difference between amber and other display colors."

Koffler is president of the Koffler Group, an office ergonomics consulting group based in Santa Monica, California. (The Koffler Group can be contacted at: 3029 Wilshire Blvd., #200, Santa Monica, CA 90403; Tel. (213) 453-1844). According to Koffler, the current debate on ergonomic issues is fraught with generalizations, misinterpretation of studies, and the tendency to try and solve complex problems with "quicky" (and usually *expensive*) high-tech answers.

He cites a common, well-intentioned, but often misdirected methodology that organizations use to approach office problems. It typically involves point optimization, the replacing of elements in the physical office environment in the hope that each new device will offer improvement. "Companies say, 'let's optimize the chairs. Then, when we're done with that, let's go and optimize the lights. Then, let's go and try to optimize

the job content.' Well, you can't do that. What you want to do is try and look at the whole thing and say, 'Where is optimization most needed?'"

To determine need, the Koffler Group closely analyzes specific office problems that require attention and makes recommendations. New furniture is not always on this list. They may, for example, conclude after studying a situation, that the answer lies in greater worker feedback, not new desks. User training is a large part of their ergonomic toolkit. Only when physical devices are the major source of problems does the Koffler Group recommend replacement. Services the firm provides can be broken down into three categories:

**Custom Consulting:** Assistance in the ergonomics of design, selection, installation, and implementation of computer and office automation systems. They also sponsor private and public seminars and workshops.

**The Office Systems Ergonomic Report:** Dedicated exclusively to decision-makers, this high-level periodical surveys the latest studies, facilities, furniture, computer hardware and software, and office-management procedures.

**Dataspam:** A skills-development training program designed to increase productivity and job satisfaction by teaching office workers techniques to aid in concentration, short-term memory retention, stress management, and control of the work environment. —S.K.



Armrests, long considered a luxury, can play an important part in reducing shoulder and upper-arm muscle fatigue.

lumbar region, or the entire chair base may tilt backward and forward to accommodate the work/intensive and relaxation/stretching postures. (Again, the relevant devices may be either the tension or locking types.) Armrests may be adjustable.

The range of adjustability should also be a consideration. The best chairs have seat heights from 16 to 22 inches, backrest

adjustments from 80 to 110 degrees measured from the seat pan, and a chair pitch of 3 percent or more. Obviously, even the most adjustable furniture will not be suitable for those individuals at extreme physical variance with the normal range. Corporate purchasing agents should accommodate as many individual requirements as possible given the resources available to them.

### IN SEARCH OF COMFORT

A checklist to help office managers and office workers decide which ergonomic chair really fits best.

**E**rgonomic chairs typically offer a better fit to the wide range of human shapes and sizes than do traditional chairs. The term *ergonomic* is not a seal of approval, however. The buyer must carefully examine specific design elements to determine if a chair will suit the purpose for which it will be used and, consequently, be worth the investment.

Here are key points to consider:

**Seat Height:** The occupant should be able to keep his or her feet flat on the floor. The control to adjust height should be located within easy reach so that the person can adjust the height without getting up. Piano-stool-type screw mechanisms are acceptable only if the chair is for one body size and the person is not working with multiple surface heights. The best devices are the gas-lift type. Look for ranges of 16 to 22 inches.

**Backrest Angle:** Adjustment of the backrest should be independent of the seat pan. It should offer support to the lower lumbar region whether the person is leaning forward or reclining. Both tension and angle lock mechanisms are offered. The best chairs have angle ranges of 80 to 120 degrees as measured from the seat. Again, the controls should be within fingertip reach.

**Backrest Height:** To position the padding exactly at the lower lumbar region

of the back, the backrest should have an adjustable height of 2 inches or more.

**Seat Pitch:** The seat and backrest should be adjustable as a single unit with a tilting range of 3 percent or more. Look for fingertip control.

The buyer might also want to look into some even more specific points. While these features may appear at first glance to be unnecessary, they actually serve some very useful purposes. Below are noteworthy examples.

**Base:** Ideally the base should be a five-star model with dual casters for mobility and stability.

**Seat Edge:** A "waterfall-drop" on the seat lip does not restrict blood flow to the feet and legs.

**Material:** Textured nylon is an ideal covering; it allows a high degree of ventilation, absorbs sound, and is durable.

**Shell:** Should be of polypropylene or polyurethane. These plastics resist staining and scuffing, and because they are color impregnated, even deep scratches won't show.

**Armrests:** Closed-loop designs are better than cantilever since the latter may catch and tear clothing. The armrests themselves should be short enough to allow the user to get close to the working surface. If possible, they should be adjustable in height. —S.K.

### Comfort by Design

Not all ergonomic features make the chairs sound like amusement park rides. Armrests, long considered a luxury, can play an important part in reducing shoulder and upper-arm muscle fatigue. Many workers complain of a "foot falling asleep" or a prickly "pins and needles" sensation. These symptoms are caused by constricted blood flow to the legs and feet.

To avoid this problem, today's ergonomic chairs have a "waterfall" seat edge, a lip that drops off sharply. It is usually well padded on top, at the edge, and even underneath to give support to the backs of the thighs. Hard surfaces are avoided underneath the lip so the chair will not contribute to blood-flow restriction even when the worker's legs are tucked away under the seat.

Chair surfaces are an important factor too. Cloth breathes better than leather or vinyl and is just as durable. Moreover, it does not produce those embarrassing squeaks. Cloth can be ribbed or textured to provide even more ventilation and has the added advantage of sound absorption, a critical element with the whirl of machinery in today's open-plan office layout. Chrome and steel shells and legs are losing

## A DIFFRIENT DESIGN

Industrial designer Neils Diffrient has updated an idea conceived by Thomas Jefferson and produced a reclining chair designed specifically for IBM PC users.

Anyone forced to spend hour after hour staring at a CPU and monitor knows that after a while, just sitting there can become work in itself. While computers are designed to make our lives easier, sitting in front of them can take its toll in the form of stiff necks and aching backs. Even the designers of so-called "ergonomic" chairs assume that workers produce best with their backs upright and their feet on the floor.

Back in the eighteenth century, Thomas Jefferson thought he had a better idea. He did his word processing (all of it manual, of course) while seated in a recliner with his feet slightly raised. Unfortunately, although this is a relatively simple arrangement for writing with a pad and pencil, it becomes a difficult balancing act when carried over to the computer age.

Industrial designer Neils Diffrient has

updated Jefferson's scheme with a new chair design for IBM PC users. Diffrient's Jefferson chair combines a recliner and ottoman with optional accessories such as a standing adjustable lamp and three separate pivoting tables that can be used to support a keyboard, CPU, monitor, and even a telephone.

### Human and Sociological Factors

Diffrient has designed everything from tractors to cameras to high-voltage towers. Since 1955 he has concentrated on designing furniture for offices with an

emphasis on human factors.

While his inspiration for the design of the chair came from Jefferson, Diffrient says his real motivation was a desire to overcome the socially conditioned view of work as suffering. "There is the underlying pressure of the old work ethic" that suggests that "if you're not suffering, you're not working. But every creative person knows that work can be a delight." He adds that Jefferson's defense for his unorthodox working posture was that the more comfortable you

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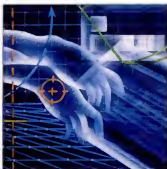
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CIRCLE 763 ON READER SERVICE CARD



Designer Neils Diffrient sitting in the Jefferson chair he created for IBM PC users.



Constant work/intensive assignments, such as heavy word processing or VDT operation, suggest chairs that enforce a constant posture.

(continued)

made your environment, "the more energy you could put into thought."

One of the more unique ergonomic features in the Jefferson chair is its headrest, which Diffrient made to duplicate the natural pivotal actions of the head as it rests on the neck. "After all," he says, "if your head isn't supported properly, you're not going to get much work done. The chair's actions are designed to parallel natural body actions."

The chair's accessories can easily support a standard IBM PC, and it has been designed to avoid cable entanglements. The Jefferson chair will be ready for delivery by the end of this year with a suggested retail price of \$2,500.

The Jefferson chair is part of a collection of adjustable furnishings the Connecticut-based designer has created for

optimum working conditions. Included are work tables, "task" chairs, privacy screens, video supports, lights, and even "in" and "out" boxes.

Diffrient is quick to point out that his furniture is designed with people—not machines—in mind. "The main theme of the collection is that it is adjustable to fit every individual with regard to their physical size and the layout of their work." Video monitors can be placed on a track so that they can be moved around from workstation to workstation. There is even an optional motor-driven adjusting system for tables and chairs when several people share the same office. Diffrient adds that his collection "was principally designed with the office in mind but can be used in the home as well." —Martin Porter

favor with design engineers, who now advocate nonglare and dent- and scuff-resistant polyurethane or polypropylene.

In recognition of "wrap-around" workspaces, most chairs are equipped with features that enhance mobility. These include different casters for hard surfaces and carpets. Casters intended for hard surfaces have a "tough roll" to prevent excess movement on flat wood, tile, or linoleum floors. On industrial carpeting, moving them may require greater exertion. Likewise, "easy rolling" carpet casters may cause the occupant to fly across the room when used on a hard floor. Five-star bases provide much more stability than traditional four-leg designs. Except for the nonadjustable side chair or lounge chair, most models allow full rotation, although some vendors combine this with a height adjustment feature, à la piano stools.

Just as corporate employees can be grouped into clerical, operational, and managerial classes, office-furniture vendors classify their chairs with titles that connote rank. Typically, there are "task chairs," the ergonomic equivalent of yes-

terday's secretarial chairs. Task chairs have the smallest seat and backrest areas, less backrest tilt, and the most contoured seats. They are designed primarily for work/intensive activities. The next step up is the operator's chair, with a slightly larger seat and backrest and a greater range of backrest tilt. Finally, at the top of the seating ladder are managerial chairs. Generally, they have the largest seats and the greatest backrest tilt. Each successive group boasts greater adjustability, which, of course, entails a higher price.

While there is a consensus that seating adjustability is desirable, a firm definition of what constitutes good seating is elusive. Rani Lueder, in *The Ergonomics Newsletter* (now the *Office Systems Ergonomic Report*) published by the Koffler Group, points out that "design recommendations by physiological and anatomical experts have been based on what is considered a desirable physiological state for long-term well-being rather than for immediate subjective comfort. These are two separate issues." In other words, a chair that feels good may not be good for you and vice versa.

A sampling of scientific and corporate studies and research confirms the lack of agreement. Reviewing orthopedic studies on the spine as well as research on blood circulation and muscle tissue, specialists can point with conviction to problem areas. Bad seating distracts the occupant with physical discomfort, restricts movement, and does not assist the body in key pressure points.

### That Nagging Backache

Modern chair designers have targeted their products for three major areas of the body. The first area is the lumbar section of the spine, which is located just before the pelvic bone. The lumbar region receives considerable pressure owing to its low location and wide curve. The second area of concern is the point at which the buttocks meet the back. Both the angle of the backrest and the contouring and positioning of the seat are key points in determining whether a chair's design adds to or detracts from user comfort. The third region is the popliteal, or backs of the thighs. The goal in this area is to keep blood circulation down to the legs as free as possible.

While the objectives of good physical posture are known, enormous complexities arise when designers try to translate those objectives into products that must cater to a diverse market. For this reason, general statements often lack accuracy. A case in point is the debate surrounding contoured seats. There is little disagreement that seats and backrests should conform to and support the natural curves and distribution of the buttocks and back. But because of the constant shifting of the body, both to perform the various tasks during the day and to unconsciously stimulate blood circulation, the typical worker can be made more uncomfortable by overmolded, form-fitting chairs.

On the other hand, a growing number of specific task conditions warrant a greater-than-normal degree of posture consistency. Constant work/intensive assignments such as heavy word processing or VDT operation, particularly where the equipment itself is immovable, suggest chairs that enforce a constant posture. These situations are analogous to driving a car. The fixed wheel and other driving controls as well as the need for constant attention require continuous upright posture. Once the initial seat adjustment is made, it is usually not changed.

Obviously there is no one ideal solution for all seating requirements. Each situation needs individual assessments and task-orientation considerations. This is the message of the Koffler Group and other consulting firms specializing in office ergonomics. The use of ergonomic chairs to improve a specific business situation is just one of many suggestions group presi-

dent Richard Koffler may make when his organization does a task analysis (see sidebar, "The Koffler Approach").

While few (particularly the users) dispute the advantages of current ergonomic chair models, a great many balk at the prices. A top-of-the-line, fully adjustable chair may cost as much as 200 percent more than traditional chairs. In dollars, this difference translates to from \$100 to as much as \$600 extra per chair. Although a shrewd tax accountant may show how depreciation and Investment Tax Credits whittle that difference down to mere pennies per day, the average consumer and, more frequently, the company office manager or purchasing agent will need more hard evidence to justify the increased cost.

### The Hard Sell

The arguments presented to support a cost-justification are classic examples of







A top-of-the-line, fully adjustable chair may cost as much as 200 percent more than traditional chairs.

slick financial analysis surrounding a core of educated guesses. Armed with typical office-worker salary and benefit figures, "average" operating efficiencies, and "conclusive results" from various European, NIOSH, and independent tests, a smart salesperson can easily show how such a purchase will pay for itself in less than 10 months and perhaps be the best investment the office manager ever made, excepting perhaps only the office copier. The crucial point comes when the buyer agrees that the chair will improve accuracy, increase output, reduce absenteeism, improve morale—in short, increase productivity.

If it were possible to prove beyond a shadow of doubt that a product would increase worker productivity by just 1 percent, virtually any capital investment of \$500 per worker could be justified. With chairs, the only direct and incontrovertible result is improved comfort that may translate into better performance. But this causal relationship is vague at best. Unlike factory conditions, where performance can be measured in quantifiable units, the office worker typically is evaluated in qualitative terms. Industrial engineers, if they are to demonstrate increased productivity in the office as they did on the assembly line, will have to define new standards that will permit objective evaluation of ergonomic products.

### Learning to Sit

No matter how many features a chair might have to improve comfort and performance, they will have no effect if the user is not aware of them or trained in their use. But how many office orientation sessions include a demonstration of the ergonomic features of office furniture?

Training users is the key objective of Dataspan, a series of seminars targeted at office workers and, especially, users of electronic office equipment (see sidebar entitled "The Koffler Approach"). Koffler, the Southern California agent, regards it as a critical element in his organization's heuristic approach to solving clients' prob-

lems. Dataspan training integrates a common-sense appeal with education to make office workers more aware and more in control of their work environments.

Jerry Solof, president of Dataspan of New York, points out that "most chairs out in offices now have some degree of adjustability." The adjustment may be as simple as a piano-stool screw height mechanism or as complex as a tilting tension knob. "They may not be aware of their ability to adjust their chairs, or they may be afraid or reluctant to do so." By making users more aware of what their current chairs' capabilities are and using positive reinforcement, such as following up on clients to see if the techniques they learned are being used, Dataspan hopes its clients will achieve productivity gains approaching those claimed by chair manufacturers.

### The Pivotal Role of Management

While the productivity advantages of ergonomic chairs may not justify the immediate replacement of all of an organization's furniture, there is enough health research to seriously consider adjustable products when making future selections. Perhaps the real question is not whether ergonomic chairs are better but whether they are worth their extra cost. For many decision-makers the answer to that question will be based less on quantifiable measurements than on management philosophy.

It is also worthwhile to note that experts in the ergonomic field refrain from citing any one item—chairs, desks, lighting, or VDTs—as a solution to all office problems. Let's not forget, the purpose of office devices, mechanical, electronic, or otherwise, is to enable the worker to perform tasks more competently. Without the active and positive involvement of the worker the advantages of any product, no matter how perfectly engineered, will be lost and the corresponding investment wasted. Reflects Koffler, "The ergonomics problem is not technology and it's not science. It is management."



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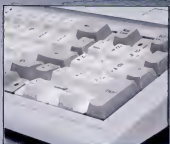
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COVER STORY • WILLIAM K. HOWARD

# BIO TECH ADD- ONS

Accessories from companies like Curtis Manufacturing make your PC ergonomically correct by filling in the design gaps left by IBM.





Is your badly angled monitor causing glare?  
Curtis' tilting monitor pedestal will improve the angle.

**T**o some, *ergonomics* means filling in the gaps left in the design of the IBM PC. If there's something about the way your PC works that makes your eyes squint, your back strain, or your fingers numb, chances are an aftermarket-accessories company has a cure.

Companies like Curtis Manufacturing, the Peterborough, New Hampshire, manufacturer of tilting monitor stands, extension cables for the keyboard and computer, and stands to get the PC system out of the way, fill in the niches in the market left by IBM.

Is your badly angled monitor causing glare? Curtis' tilting monitor pedestal will improve the angle. The typical office desk's 18- to 24-inch deep typing return is too narrow for a PC and keyboard, but Microcomputer Accessories, of Culver City, California, has a sliding keyboard storage stand that rolls out the keyboard and then hides it away. And, if you don't like the feel of your official IBM keyboard, see Key Tronic for a better one.

#### Informal Operations

Not only are companies such as Curtis smaller than Big Blue, but their product-development processes may be more informal. Curtis' Tom Judd recalls the origin of the company's first product, the \$80 PC Pedestal.

"A friend who works in the minicomputer industry called me at 5:30 in the morning and said he had this terrific idea: The PC needed a tilt and swivel base because it was aimed at the commercial-industrial market where people normally use mini- and mainframe computers that have tilt-and-swivel-base monitors."

This happened in February 1982. Judd says he sketched out a design on the back of a napkin, which evolved into more formal drawings and finally a hand-built prototype made by two little old New England craftsmen for

about a thousand dollars. The testing procedure entailed playing with the prototype at a Sears Business Center and taking it to PC-using friends for their reactions. Everyone agreed that the tilt-and-swivel base provided PC users greater flexibility in angling the screen and cut down on glare. The first PC Pedestals were shipped 6 months later, in August 1982.

Since then, Curtis has expanded its line to eight products, which include a cheaper, universal-fit tilt-and-swivel platform (the original PC Pedestal fit only the IBM monitors), an adapter to use the Princeton and Quadchrome color monitors on the PC Pedestal, monitor-extension cables, a keyboard extension cable, color-monitor extension cables, a plug adapter to power non-IBM monitors through the PC system unit, and a vertical system stand. The stands are all made of tough ABS plastic, and everything carries a no-questions-asked lifetime guarantee.





The 3-foot monitor extension cables were developed because the PC system unit could only be placed to the right side of the monitor. The power and signal cables that are supplied with the PC aren't long enough to stretch to the left side. Some PC users, especially those with expansion chassis from outside suppliers such as Tecmar, had the monitor placed atop the stack, and the screens were too high.

Customer demand led to the separate 3- to 9-foot keyboard cable. To hear Judd explain it, the standard PC keyboard exudes something on the order of a bad karma, at the same time, of course, that it creates a potential goldmine for compa-

nies like Curtis:

"On the PC, the keyboard cable is a little bit tense—too short, or whatever. You can't move or relax comfortably. In the operation of the machine, you pick up that tension, either emotionally or psychologically, with predictable consequences. As soon as you put an extension cable on the keyboard, you're freed of that subconscious tension. But you never know this

**Computer ergonomic accessory makers are the custom tailors of IBM PCs. While the off-the-shelf model is the same for all, add-ons like screen swivels (far left), vertical stands (opposite page, bottom right) and visored screens (near left) can make machines fit individuals.**

## A LITTLE HIGH-TECH TOWN

Peterborough, New Hampshire, is the home of Byte, Popular Computing, and high-tech companies like Curtis Manufacturing.

Peterborough, New Hampshire, doesn't have the high-tech cachet of Silicon Valley, yet this town of 4,500 residents and about 9,000 jobs is no stranger to the computer industry.

Located an hour and 20 minutes northwest of Boston, Peterborough is the home of *Byte* and *Popular Computing*. The Beck Diskettes company does business there, and New Hampshire Ball Bearing turns out bearings for disk drives. NEBS Computer Supplies is also located in Peterborough.

Curtis Manufacturing is tucked in what was once a ranch house and a grocery store. The setting is almost typical New England; a brook flows alongside the road; the Post Office is next door. From the outside, nothing about the Curtis building suggests high tech. It doesn't even have a sign. In fact, visitors to the facility are directed to look for a sagging brown roofline, soon to be straightened as the company expands for more warehouse room.

Inside, the existing warehouse area is filled with thousands of pedestals,

cables, and stands that are ready for shipment. (The actual manufacturing is done throughout New England and final assembly and testing is carried out by 55 handicapped workers elsewhere in Peterborough.)

In the office, a pair of IBM PCs track orders and maintain customer lists, although initial order-taking and warehouse tasks are taken longhand, which is actually faster. Each night the orders are logged into the PCs.

Each PC started life as a "plain-Jane PC, as cheap as I could order them," says Judd. Now, one has 512K RAM and a 10-megabyte hard disk from Kammern Laboratories. The other has 640K RAM, a Tecmar expansion chassis, and a 15-megabyte hard disk. An IBM monochrome monitor is used for displaying text, and a Princeton Graphics System RGB monitor handles charts and graphs. Two Okidata 84s spit out invoices and mailing labels. "Nothing ever goes wrong with the Okidatas," says Judd. "If they broke tomorrow, I'd still feel I've gotten my money's worth."



For software, Judd relies on the IUS accounting package, after an initial false start with the Peachtree package that didn't mesh with Curtis' style of business. The company uses *dBASE II* for generating mailing lists, though Judd wishes it had random-length fields. Lotus' *1-2-3* produces spreadsheets and graphs that show Judd how far he's come in 2 years, and IUS' *EasyWriter II* takes care of word processing.—W.K.H.



How much time goes into coordinating plans with the way a worker actually works?

## THE ERGONOMICS OF MOTION

The best-laid human factors plan can be led astray if the way a worker moves isn't taken into account.







C

Hundreds of hours can go into planning the desks, chairs, and keyboards for a PC installation, but often virtually no time goes into coordinating those

plans with the way a worker actually works. Here are three views of the ergonomics of individual motion. **A** shows the motions of a power typist. **B** depicts a

worker with documents spread all over. And **C** is a workstation for meeting customers. Human factors must conform to the body and to a worker's movements.

until you try it both ways."

### Double-edged Living

For Curtis, depending on IBM for a living is a double-edged sword. Because there are so many PCs in use, a vast potential and growing market exists, yet there's always the danger IBM could decide to develop its own tilting monitor or longer cables.

If IBM added a pedestal to its monitor, it might be taking away business from companies like Curtis. On the other hand, incorporating the pedestal is a statement of the need for this accessory. And knowing that 2 million PCs have already been sold without them, Curtis could increase its market base just by farming the market that's already out there.

Judd is confident there always will be a market for ergonomic add-ons for IBM products. For example, Curtis is working on an adapter that tilts and raises the IBM PC Portable and Compaq, because it believes the screens on both are poorly angled. And to keep from putting all the Curtis eggs in one basket, as-yet unannounced products are being developed for the Apple IIc and Macintosh.

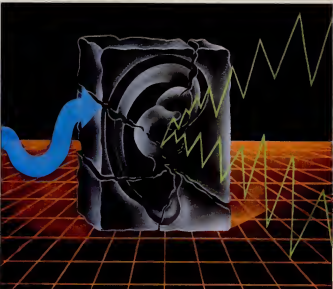
### Phenomenal Growth

In 2 years, Judd has gone from a minimal investment—\$8 to cover the price of a notebook, graph paper, and colored pens for a presentation to a bank for funding—and a business run out of a garage where he once built Buick drag racers in the late 1960s to a staff of nine, two IBM PCs to keep track of business, and a network of more than 1,000 dealers selling Curtis products.

"I'm going to stay in the accessories area because I don't know enough about software or hardware," says Judd. "There are many opportunities for entrepreneurs within the personal computer arena. You don't have to know computers or how to run them as much as be able to look at them and say, 'I could improve it in a certain way and sell that improvement to others.'"

## GOOD VIBES, BAD VIBES

In small amounts, sound is a comfort to workers, but too much noise rings in bad news for computer productivity.



While the bulk of ergonomic development regarding PCs has centered on the form of the working equipment, all the clever design in the world can be defeated by a single environmental effect—noise. A fabulously sculpted keyboard and a perfectly tilted screen are of scant value if the worker is made tense and scatterbrained by a barrage of unwanted sound. The problem with evaluating noise as an ergonomic factor is exacerbated by the fact that hearing is the most subjective sense. One person's rock opera is another's caterwaul. However, some general sound impacts have been noted by scientists: Irregular noise is more disturbing to computer work than regular noise, and high-frequency sounds seem to be more disturbing than

low-frequency ones. At the other end of the scale, though, complete silence is even more distracting to work concentration than most noise sources. People require what is known as white noise—rustling papers, air conditioner fans, vague street noises—to feel connected to the world outside, and to their work as well. In practical terms, this peculiarity of human psychology means that a computer with a completely silent fan may make workers more uneasy than one that makes a bit of reassuring noise. The PC-XT, with its whining fan, should be quite comforting. Also, these rules mean that intermittent noise sources, such as printers, should be isolated from an individual's work area—an argument in favor of local area networks.

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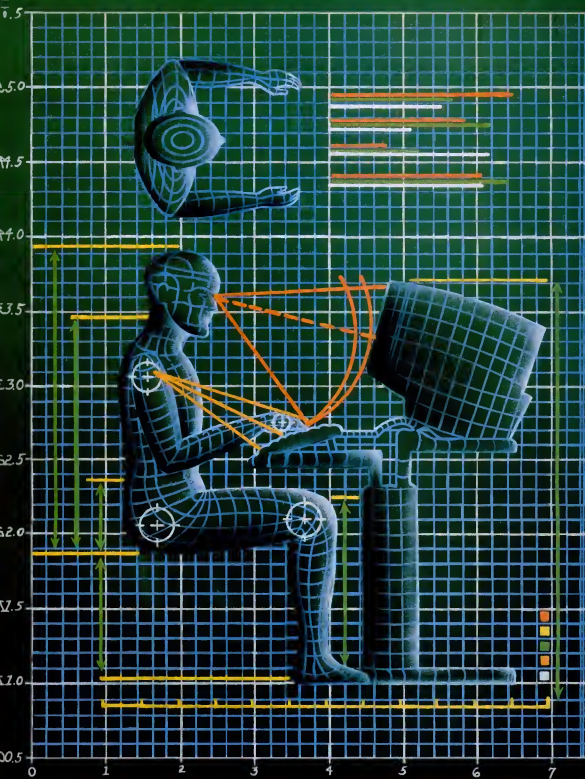
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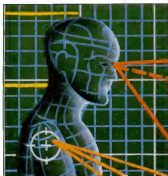
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COVER STORY • MARTIN PORTER

# FACTORING IN THE HUMAN ELEMENT

Who put the LFD on the floppy disk drive? Who thought up the Ctrl-Alt-Del combination? Meet the staff of IBM's Human Factors Lab, the unsung heroes of ease of use and ergonomics



Even a tossup is a conclusion to pass on to the industrial designers and marketers.

**T**he task is child's play. I've been instructed to use a joystick prototype to keep a cursor within a moving box on an RGB screen. My aim is true, but every time my eye strays, the PC on which I'm working emits an annoying bleep. An overseer studies my every move like a voyeur watching his neighbor's bedroom window.

The scene isn't the showroom at ComputerLand or the floor at a computer trade show. This bare cubicle is the Human Factors Lab at IBM's Entry Systems Division in Boca Raton. My overseer is a human factors engineer—someone who has combined an interest in psychology and industrial engineering into a profession that involves watching people perform tasks that may seem insignificant and strange.

This ergonomics engineer and his colleagues are trying to determine whether computer users prefer free-action joysticks (which stay where you leave them) or spring-loaded ones (which return to the center). It's not the kind of study that will change the course of microcomputer history, but it is typical of the sort of questions this staff of seven scientists must answer before IBM approves any product design, from the color of a monitor screen to the placement of the power supply switch to the design of a keyboard interface or a software menu.

When I tell Peter Kennedy, an advisory engineer for IBM, that I prefer the spring-loaded joystick, he smiles and punches up a series of instructions on the PC keyboard to report my accuracy with each joystick. Surprisingly, the scores are the same. Kennedy is reassured by the results; he has culled similar responses from 250 other test subjects.

"We found that it doesn't really make much of a difference, in terms of accuracy, whether the joystick is free or spring-loaded," he explains. "User preference was split as well."

Kennedy isn't disappointed, though. Even a toss-up is a conclusion to pass on to the industrial designers and marketers, who will ultimately decide the shape in

which a product will be released.

### Divergent Interests

If the final decision for every IBM product released were made in the Human Factors Lab, the PC family wouldn't be quite the same. The talk here revolves around ease of use, friendliness, human response, and the real world—not manufacturing costs, marketplace, or competition. But the lab's staff certainly carries some influence: management's response to the joystick experiment was to offer the PCjr with both spring-loaded and free-standing joystick options.

The Human Factors Lab has been involved in every IBM design since 1978 when, at a corporate meeting in Tarrytown, New York, IBM executives decided to establish a Human Factors Lab at every IBM product site. The one in Boca Raton began with the design of the Series One and has since made its mark on robotics as well as all PC-family products.

While it is up to marketing to make sure that the products have the right mix of sex appeal and serious application, it is up to Human Factors to measure any productivity improvement or decline. Systems managers take all these factors into account, and the end result is inevitably a compromise.

The IBM PC keyboard, for example, drew its share of criticism (long before the PCjr keyboard stole the negative limelight) because of the small size and unusual location of the Shift and Enter keys. The lack of an indicator light on the CapsLock key has sent millions of PC users flicking back and forth to find out which mode they are in.

Human Factors recommended putting a CapsLock indicator on the PC keyboard. The staff also feared that the small Enter key would decrease typing productivity. However, in both cases the powers that be had other concerns: The indicator light would have increased manufacturing costs, and a diminutive Enter key was necessary to make room for the ten function keys.

The Human Factors Lab did, however, leave its stamp on the PC keyboard. The detachable keyboard was designed in this office. Human Factors' engineers also suggested offering two typing angles, 4 and 12 degrees. They have since discovered that PC typing productivity is improved at the 12-degree angle.

The PC community also owes the Ctrl-Alt-Del system reset to this unheralded crew. When the prototype of the PC keyboard was tested at the Human Factors Lab, it had a one-button reset design. "We said, let's not make it that easy for people to destroy something they spent hours creating. Let's give them something a little bit obscure and a little bit harder," Kennedy recalls.

The Human Factors Lab also prevailed when it came to the presence of LEDs on the PC disk drives. Perhaps the same group that nixed the CapsLock LED wanted to eliminate them to reduce costs.

### The Jr Keyboard

The Human Factors Lab is partially to blame for the lambasted PCjr keyboard, but again compromise was the real culprit. The keys had to be spread apart so that overlays could be used, and, as a result, the raised keys obscure the lettering.

Otherwise, Kennedy says, the overall keyboard structure is not all that unique. In fact, each *jr* key has about the same area as a PC key, so the size shouldn't decrease typing speed—or so his studies said. The Human Factors scientists take credit for the return of the Selectric-type Enter key on the *jr*; they found that a large Enter key results in fewer overall typing errors.

The scientists at IBM Human Factors don't mind speaking of past errors. Unlike marketers, who have to sweat out dealer complaints, the staff here has gathered, through its mistakes, more data about the way humans interact with intelligent machines. However, the lab's charter is to ensure that those mistakes don't happen again. In fact, IBM corporate memo number 105, taken seriously in this lab, states

that all new IBM products must be as good or better than anything else in the marketplace.

Pointing devices and icons are current topics of exploration, which offers a clue to what's on IBM's mind in this season of the Macintosh. The lab staff is also involved in studying screen color and contrast.

However, it isn't because of a human factors advantage that the PC portable sports an amber display. Marketing came up with that brainstorm; tests at the Human Factors Lab found no discernible difference between amber and the traditional green screen. The staff here looked at tubes with green phosphor and tubes with amber phosphor with the same font, same brightness, and same contrast ratios—and were able to find no difference in legibility.

The lab's current screen study involves color contrasts between type and background on RGB monitors. Volunteers have been passing through the offices lately to help answer a question that has the entire computer human factors community puzzled: Which screen colors work best together and cause the least eyestrain?

Having worked with a variety of color combinations with *WordStar* on my color monitor, I'm a perfect guinea pig. The scientists sit me before an IBM color monitor and maintain the distance between my eyes and the screen with a metal brace. The machine flips through a series of color combinations from near-invisible blue-on-black to psychedelic red-and-blue. I must first press the spacebar, followed by the appropriate letter—a procedure that puts typists and nontypists on equal ground. The response time I take to identify each letter is added to an ongoing database the lab will be accumulating over the next few months.

"The theory is to use high contrast and colors that are far apart in the spectrum," says Alan Happ, a staff engineer. "But you can't follow that rule strictly since you'll ultimately come up with red and blue, which is a horrible combination."

### Ergonomics and Icons

Happ's specialty is software ergonomics, which at this time accounts for about 80 percent of the lab's work. Other projects include watching people unpack their equipment. IBM printers originally came mounted to a piece of plywood; when a subject pulled out a sharp pair of scissors to undo the fasteners, the Human Factors staff shrieked, "No plywood!"

Icons are the software issue of the year, though the researchers aren't as hot on pictorial instructions as some of their peers. Happ explains, "In terms of word processing, why do you need icons? Are they for people who can write and not read? But icons do have their place. They are great on Monday morning when you come in bleary-eyed and can hardly remember your name, let alone the commands. Icons are a crutch, but after you get going you don't want them there. They make software easy to learn, but you have to be able to turn them off."

Happ did IBM's research on the original iconography that Sierra On-Line designed for *HomeWorld* for the IBM PCjr. He found that 30 percent of the *HomeWorld* test subjects were confused between two critical computer commands—SAVE and DELETE. The insert icon depicted an arrow pointing at a broken page; people interpreted that as ripping up the work instead of inserting new text.

This experiment has led to more generalized studies on exactly what makes a good icon. For instance, the lab staff believes that icons may be regional. To test the effects of geography on icon interpretation, IBM is currently evaluating a range of icon designs at its scientific centers in Heidelberg, Germany, and Austin, Texas.

The icon recognition issue is as unresolved in current computer ergonomics as pointing devices, another subject in which the IBM lab is involved. Human Factors engineers are "actively looking at many pointing devices," says department manager Don Davis. He explains, "Innova-



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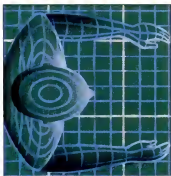
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## HUMAN FACTORS



Icons are great, especially on Monday mornings when you come in bleary-eyed and can hardly remember your name, let alone the commands.

tion is a good thing, but just because it is new doesn't mean it is better. I can think of a number of things that are clever and flashy but gimmicky. They sometimes sell systems, but they are not necessarily better. If we can't measure productivity, it is not an improvement. We're looking for improvement."

To illustrate the point, Davis stands at his desk and displays the backless Norwegian ergonomic chair upon which he sits. The chair is not standard IBM issue—there's no blind allegiance to IBM designs here, though Davis says he is careful not to bite the hand that feeds his budget.

He explains that even though IBM makes a more traditional and competitive line of ergonomic furniture, he commanded one of three backless chair samples for his work area. "I saw the chair as a gimmick," he admits. "We figured we'd test them for a couple of weeks. That was almost a year ago. I guess you'd say we're our own best guinea pigs."

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9a. Please indicate below the applications for which these Personal (Micro) Computers are used.

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|---|---|
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One fact that became eminently clear during our investigation of PCs and human factors is that ergonomics reflects human diversity. There is no universal "ergonomic" look. When properly applied, human factor concepts create workplaces that serve the need of the worker, not the designer.

As this collection of photos shows, the



variety of ways in which ergonomic ideas have been realized is impressive, both in scope and creativity.

A Denver architect's office (opposite page, top left) blends flexibility of desk height with an incredibly sleek look to put the PC in perfect position. Two ergonomic interpretations of conference rooms (opposite page, top right and this page, below) place the machine at the center and ends of the table. Workstations can be targeted at human factors such as text workers (above, left) or computer artists, who are used to slanted surfaces. Many ergonomic work places favor the Biochair (opposite page, bottom), which adjusts to the individual. ■







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# Crossing the Compatibility Desert with Remote Control

▲  
The  
word  
processing,  
communications,  
and remote access  
software offered by  
Kensington Microware, Ltd.  
enables the PC to talk to  
two popular lap computers, the  
NEC PC-8201A and the Model 100.

## REMOTE CONTROL

Throughout history, countries have wrestled with the problems caused by their difficulties in communicating with one another. Unfortunately, computers are a lot like countries. Each has its own characteristics, idiosyncrasies, language, and system of operations. And, as in the world at large, there can be true peace and harmony in Microland only when all computers learn to communicate. This communication is especially important now that portable, lap-size computers are coming into their own. With their limited memories, these portables are most useful when they can interface with a larger computer.

I, for example, am firmly committed to letting my fingers do the walking and talking for me. Consequently, I use my PC mostly for word processing screenplays, story treatments, magazine articles, and business correspondence. Last year, I bought a TRS-80 Model 100 portable to use at meetings, on planes and trains, and while working out of town. I planned to upload my portable's data files into my PC and work on them from there. I didn't realize how difficult it was going to be to get the two computers to talk the same language to each other.

Two major problems kept the screens of my two electronic marvels dark and silent when in each other's presence: lack of the right kind of cable (null-modem) for direct data uploading and downloading and lack of communications software to accomplish that task while meeting my other telecommunications needs. IBM

could tell me nothing about interfacing the two machines, and Radio Shack could only assure me success when hooking up the Model 100 to another TRS-80 computer. (It suggested "trashing" my PC for a Radio Shack desktop. My response to that idea was unprintable.)

I figured that with the popularity of the PC and the new lap computers like the Model 100 and the NEC PC-8201A, it wouldn't be long before someone designed a sensible software package that would translate between them. Kensington Microwave, Ltd., finally came through with *Remote Control*.

### A Communicator

*Remote Control* is a straightforward piece of integrated software designed to allow two-way communication between an IBM PC (or compatible) and either the Radio Shack or the NEC portable. That communication can be by direct cable connection or over telephone lines using a modem. The very nature of this program demands that it be integrated, since moving text files between computers requires easy—and often simultaneous—access to both telecommunications and word processing software.

*Remote Control* comes with a program disk and one backup, the appropriate cable for direct connection, and an easily understood technical manual. The two disks are protected so they can't be copied. Separate files can be copied onto or from the disks, but in order for the program to work, you must use the original disk. The cable provided for direct connection works fine, but it could be longer than its barely sufficient, 35-inch length.

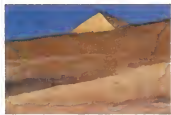
The *Remote Control* manual has obviously been written to be read and understood by normal human beings. Even the program's more technical aspects are explained clearly and concisely. The manual includes a *User's Guide* that explains the operation of the program's functions, a reference section with more detailed information on each function, and a simple tutorial to help you get your feet wet. The

appendixes cover support topics, including installation of the master disk (an important custom feature that tailors your program to the portable you're using and your PC's memory capacity) and the various hardware hookups.

*Remote Control* is built around four basic communications functions—Direct (direct cable connection), Telcom (telecommunications), Host (remote PC operation), and Text (text processing). Each operation is accessed easily through clear and simple menus. The commands you use to drive the program are, for the most part, either identical to or based on those used by the Model 100 and NEC PC-8201A. This similarity means you have relatively little new terminology to learn.

The main menu (see Figure 1) offers access to the system's seven options—the four communications and text-editing

Remote Control is a straightforward piece of integrated software designed to allow two-way communication between an IBM PC and either the Radio Shack or the NEC portable.



### PC

#### *Remote Control*

Kensington Microwave, Ltd.

251 Park Avenue South

New York, N.Y. 10010

(212) 475-5200

List Price: \$180

Requires: 64K RAM, one double-sided disk drive, NEC PC-8201A or TRS-80 Model 100 lap computer.

CIRCLE 800 ON READER SERVICE CARD

functions, plus a Help option (which contains short explanations of the other options), a Configuration option (to change and tailor certain text, printing, and communications parameters), and a Return to PC-DOS option (to exit the system or use DOS). Once you choose any of the basic four functions, either a submenu or a simple list of instructions guides you further (see Figure 2).

## Telcom

The first entree on the menu is Telcom, which allows your PC to send a call to or receive a call from another computer. You also use the Telcom option to communicate with information utilities such as CompuServe, The Source, and the Dow Jones News/Retrieval Service.

Kensington built the Telcom function around the telecommunications capabilities of the portable computers. These capabilities include features such as auto-dial and auto-logout. You do need a separate modem for your PC and the NEC; only the Model 100 has a built-in modem. *Remote Control* works particularly well with the Hayes Smartmodem 300 and 1200 models. Most of the manual's references to external modems refer to the Smartmodem's, but you can use any comparable device. If you use another brand, the manual has notes on adaptation.

Once you have chosen the Telcom option, *Remote Control* immediately sets the communications parameters to be compatible with your particular portable. To change the parameters, you can use one of the PC's function keys, which Telcom assigns to particular functions in a list appearing at the bottom of the screen. A separate entry in the appendix explains the various communications parameters and their alternate values.

You can place a call from your PC either manually or automatically. For manual operation, simply hit the function key for Call and enter the phone number you want. Including angle brackets (< >) after the number puts you immediately into Terminal mode, in which the PC

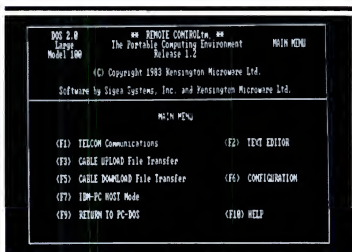


Figure 1: The Remote Control main menu shows the active version of DOS and the portable in use as well as the program's major functions.



Figure 2: Under the Configuration option, you can control key program parameters. In this screen, the parameters remain in their factory settings.

emulates a terminal, for interactive communications.

To set up the auto-dial feature, you create a text file called ADRS.DO. You can create this address file either on your PC or on your portable and edit it with the text editor. Each entry in the address file

includes the name, the number, and the address of your auto-dial destination. Again, you can include the brackets after the number for entry into Terminal mode.

To use auto-dial, you enter the name of your destination after hitting the Find

## REMOTE CONTROL

function key. When the number appears on the screen, you then press the Call function key. The computer does the rest. If you don't use the brackets after placing a call, your PC will merely dial the number. Once the connection is made, you have 30 seconds in which to press the Term function key (to complete the connection and enter Terminal mode) or to pick up the phone receiver for a voice call.

Auto-logon is a convenient way to store and send all the information—the access phone number, your identification number, the password, plus other needed codes—that you must have to call and access frequently used services such as The Source. The auto-logon commands are the same as those that are used on the Model 100.

Once in Terminal mode, the function key assignments at the bottom of the screen offer several convenient options. You can display the current disk directory, change the logged disk for file transfer, change any of the configuration options, access the Help screen, toggle between full and half duplex modes, toggle the Echo function on and off (Echo sends everything you see on your screen to your printer), toggle the document filter on and off, download or upload files, or disconnect. Every function you need is either listed on the screen or easily found in the manual.

### A Problem

Uploading and downloading files is straightforward, both on the screen and in the documentation. But while testing out the Telcom option, I did encounter one interesting problem. I discovered that when my PC called the Model 100, the portable was unable to send decipherable keyboard commands back to the PC. The PC received a jumbled message of strange characters with just a smattering of the correct letters. Keyboard commands from the PC came across perfectly. In reverse, though, when the other computer called the PC, sending keyboard commands in

either direction was no problem.

As far as I could tell, all the hardware was operating correctly. That left the software. After rechecking the manual and finding nothing that would help trouble-

## When my PC called the Model 100, the portable was unable to send decipherable keyboard commands back to the PC.

shoot the problem, I decided to contact the company.

Kensington Microware has no WATS line, and the company will not accept collect calls from anyone, for any reason. I called direct, and my call was passed on to someone with technical expertise to whom I explained my problem. I was told someone would get back to me with an answer later that afternoon. Much later that same afternoon, I called again but had to leave a

message. I was again told someone would get back to me. Finally, three days later, a technical representative returned my call. He swore it couldn't be the software: it must be the Model 100's modem, he said. Radio Shack convinced me that it wasn't the Model 100. I knew it wasn't the Hayes modem or my PC. The mystery remains unsolved.

Another important *Remote Control* feature is the IBM PC Host mode, which permits you to access and control your unattended PC from the portable over the telephone. (Host mode is a main menu choice.) Files can be moved back and forth, PC-DOS commands can be executed, and standalone programs can be run. In this mode, the program asks for a password once the phone connection is made. You preset the password while in the Configuration mode. If the password isn't entered correctly from the remote site after four tries, *Remote Control* will disconnect.

To make *Remote Control* even more convenient, you can create a batch file that will start up the program and enter it directly into Host mode. If you expect to



Figure 3: A menu screen in the portable computing environment for transferring files via cable from the portable computer to the IBM PC.



phone your PC from a remote site at a specific time of the day, you can set a timer to turn on your PC and your printer. With *Remote Control* and a data disk already loaded into the PC, your batch file could install the program, enter the main menu, select Host mode, and ready the PC for your call. You can even have the program automatically call up a specific file and have it ready to appear on your remote screen.

Once connected, you can move files back and forth, check files, send commands and messages directly on the remote keyboard back to the PC, and print out whatever you like (as long as your printer is on). You can control the current disk drive on the PC, erase or rename files, and toggle the Echo, Remote Computer Screen View, and Document Filter functions on and off.

The document filter removes unnecessary single-line breaks in the text that you are transferring. Kensington recommends using the filter when transferring *WordStar*-type files. I tried uploading and downloading a *WordStar* file and found that the filter did little. The file was a dou-

ble-spaced document. When I downloaded it into the Model 100, it appeared unformatted and hard to read. The line spacing alternated between single and double. When I uploaded it back into the PC, the document appeared in its double-spaced format again, with new carriage

---

## The PC Host mode permits you to access and control your unattended PC from the portable over the telephone.

---

returns placed after each line. Although the document appeared to be back in its original form, the new carriage returns inserted by *Remote Control* made reformatting it very difficult. Transferring a single-spaced *WordStar* file worked better.

The Direct Connection function allows

---

If your password isn't correctly entered from the remote site after four tries, *Remote Control* will disconnect.

---

easy uploading and downloading of text files by direct cable hookup between the PC and the Model 100 or NEC PC-8201A. In the main menu, this function is split into two separate operations—Cable Upload and Cable Download. The manual claims that the transfer speed is 15 times faster than that of conventional telephone communications. All I can vouch for is that at 9600 baud, it's fast enough.

The menu screen in either mode offers the current directory of whichever disk drive you choose, as well as the function keys for changing the default drive, returning to the main menu, or toggling the document filter on and off (see Figure 3). Once the portable is set in Terminal mode, *Remote Control* issues a simple list of instructions on both the PC and remote computer screens. The transfer in either direction is then painless.

You can accomplish direct cable uploading or downloading between a PC and one of the portable computers without using *Remote Control*, but the process is tedious and often incomplete. For example, it's possible to create a terminal communications program to work in PC-

## REMOTE CONTROL

DOS to upload or download files between the two computers. Unfortunately, the one I tried leaves you with text files completely unformatted and unreadable. You're then forced to boot up a separate text editor and go through the inconvenience of having to reformat the mumbo-jumbo brought across from the Model 100 into the PC. And text editors usually cannot manipulate a file created on another text editor. *Remote Control* combines communications with a built-in text editor and also provides many internal peripheral features that mercifully reduce clerical work to a minimum.

### Text Editor

The built-in text editor is particularly useful once you've moved the text files from one computer to the other, because you're probably going to need to work on them. After your data is transferred, it can be instantly formatted and edited without leaving the system. The fully functional text processor mimics the system designed into the portables, with additional features that make it even more powerful when used on the PC (although it does have some limitations).

*Remote Control's* text editor is best used for standard format documents or files of a reasonable size. File lengths are limited to 64K or 65,453 characters (that's about 40 double-spaced  $8\frac{1}{2} \times 11$  pages). For straightforward work, it's quite fast and probably all you would need. The main menu takes you into a submenu for text editing (see Figure 4). Three function keys give you the choice of displaying either drive directory, returning to the main menu, or getting help. Once you choose an existing file to edit or start a new one, you're ready to work.

Aside from your text, your main screen consists of a ruler line indicating your line width, the displayed filename and disk drive, a numerical value indicating how much text memory has been used so far, and the function key designations. When you press the Alt key, you get your current cursor position, how much text memory

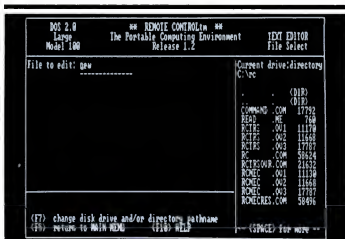


Figure 4: With *Remote Control's* text editor, you can start a new file or retrieve an old one for editing by using the File Select screen.



Figure 5: A standard format file for a personal letter that includes comment lines identifying the file by author, date, and so forth.

you've used at the cursor point, how much you have left (based on the 64K length limit), and how many characters are in the Paste buffer (part of the block-edit function).

The standard ten function keys allow you to find a string of text or find and

replace a string, load a specified text file at the cursor point, issue block-edit commands, save the file, save and return to menu, and obtain explanations of the other options. There are also nine active Alt-function key combinations that augment the Find option, display the current drive



directory, change the current drive, erase a specified file, append (save a specified block text to a separate file for creating and updating, say, a table of contents or a glossary), change the edit line width, quit without saving the file, print commands, and explain the other Alt options.

The text editor's cursor movements are almost identical to those of the portables with the exception of the PgUp and PgDn keys, which work as indicated on the PC, and the Home and End keys, which jump you to the beginning or end of your file when used with the Ctrl key.

The program includes such standard features as word wrap, text delete, and block editing. I found the editing faster and simpler even than that of *WordStar* with ProKey. Inverse video display of the text you've blocked off makes tracking it effortless. Deleting text can be done with the Backspace key (auto-repeating), the Del key, or the Shift-Del key combination to delete words at or to the right of the cursor position.

One interesting additional feature allows you to recover deleted text—a Delete buffer. To recover a word, a line, or a few letters you deleted by mistake, simply use the Ins key. Each time you press it, you get back one letter. The Shift-Ins key combination returns whole words from the buffer.

### Drawbacks

Once you begin typing, you realize that *Remote Control's* text editor single-spaces all text on the screen. And once you get to where you think the bottom of the page should be, you find the text just keeps going and going, without any indication of page breaking.

You encounter these peculiarities because the *Remote Control* built-in text editor uses a lot of embedded codes to do routine things. That method might be all right if you didn't have to wait until you print to find out, for example, how your line spacing and pagination work out.

You can have your document printed with whatever spacing you want. All you

do is set an embedded code at the top of your file and your printer will do exactly what you've indicated. But while you're creating the document, it's very difficult to keep track of how long it is. That problem is made worse by a lack of on-screen pagination. Again, an embedded code must be set at the top of your file for automatic pagination. You can't see what's happening unless you go into Print mode every once in a while and preview your document.

The NUL command in the Print mode allows you to preview on the screen exactly what your printer will be printing out, including any operations dictated by embedded codes. In order to check your file, you must go through each page. There's no way to shuttle or scroll through the preview screens. The NUL command is great for checking your work prior to printing, but if you must constantly use it to keep track of how many pages you have, it can quickly become tiresome and inconvenient.

The printing function works well, but it is too limited for my tastes. When you hit the Alt-F9 key combination from the editing screen you're given only three printing

options—edit line width (it defaults to a preset width), print (it defaults directly to printing), or NUL (to preview your formatted text).

In addition, the printer will print only the entire file. *Remote Control* has no provisions for individual page printing within a file. If you want to print only part of a document, you must create a separate file for just that part. Of course, for quick checks on individual pieces of a document, you can always use the PrtSc key. But remember, when you do, it prints everything on the screen, including the ruler line and the function key commands along the bottom.

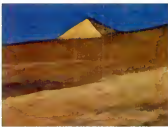
Other embedded codes control page centering, margin setting, indentations, leaving blank lines for later insertion, titles, headers, footers, and special text and printer formatting needs. To avoid having to constantly set up formats for frequently used documents, you can create standard format files, complete with a listing of embedded codes (see Figure 5).

One feature I would liked to have seen included is hyphenation. Many lines of text end up unusually short and awkward because what should have been the last word was too long to fit intact on the line. There is also no way to incorporate a built-in spelling corrector.

I used the text editor to do the basic draft for this article. It proved adequate enough, although I don't think I'd be happy using it as my principal word processing program. Nonetheless, my Model 100 can understand it, and it's infinitely easier to reformat the editor's output into *WordStar* than the other way around. Combined with *Remote Control's* communications functions, it makes for a usable, efficient integrated package.

I think anyone with a PC and one of the lap-size portables will find *Remote Control* a welcome addition to a software library. The system's useful features outweigh its disadvantages, and the uninitiated, nontechnoid user should have little problem understanding it. Kensington has negotiated a détente in Microland. ■

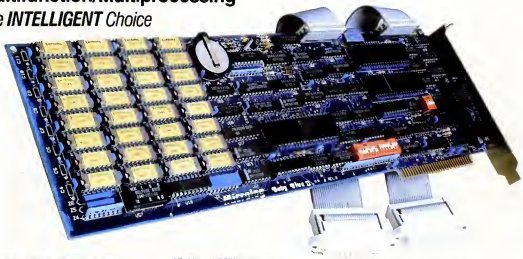
Remote Control's text editor is best used for standard format documents or files of a reasonable size.



# Baby Blue II

## Multifunction/Multiprocessing

The INTELLIGENT Choice



### Packed with ALL the popular features:

- Up to a 256 KiloByte Memory Expansion, optional in 64K blocks.
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- Parallel Port for use with IBM/Epson and most other parallel printers (addressable as LPT1: or LPT2:).
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- Baby Blue II is fully compatible with the IBM PC, the PC/XT and other compatibles, including the Texas Instruments Professional Computer.

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With all that hardware to manage, we think a board should have a brain. You won't find this feature on other boards—they may look pretty, but they can be pretty boring once you get them home. Baby Blue II is actually a second computer inside your PC, built around the high-speed Z-80B microprocessor.

- **Background Processing:** Compile, assemble, sort, calculate, communicate or print—all in the background, while you and your PC continue to work on other tasks in the foreground. Because it is a separate computer, Baby Blue II performs these functions without slowing down your PC, helping you to do more work in less time.
- **Autostart at Preset Time:** Baby Blue II can begin any task, even a background operation, at a specific time by consulting the on-board real-time clock.
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- **Dual Ported Memory and I/O:** You can use Baby Blue II's memory, ports and clock as ordinary enhancements to your PC. Or, you can let our Z-80 micro-processor control the board directly, for truly independent back-ground operation.

### All this and SOFTWARE too . . .

#### Systems utilities

**POD RAMdisk Software:** creates a FAST pseudo-disk drive of any size in available system RAM. The OOS 2.0 version lets you change the size of your RAMdisk from the keyboard.

**Print Buffer/Spooler:** a TRUE print spooler: the Z-80 buffers and manages printing independent of your PC. Unlike other so-called "spoolers", this one won't stop your printer or slow you down when you start another job.

**Clock Software:** sets Baby Blue II's clock and initializes the system clock at boot time—never type the time and date again!

#### Communications

**Smart Terminal Emulator Package (STEP):** talk to other microcomputers or connect to larger host computers, as an asynchronous terminal through Baby Blue II's serial ports. Unlike other "smart terminal" programs, STEP offers full emulation of popular video display terminals (the standard package includes TeleVideo 950 and Hazeltine 1500).

IBM 3101, DEC VT100 and many others are optionally available). You can send or receive text files, and with STEP's unique Sessions Menu, changing your configuration is a keystroke away.

**BSTAM File Transfer Utility:** Transmits and Receive text, HEX, and binary files (including .COM files) without errors and without fuss. BSTAM is easy to use, with all configuration parameters handled transparently under STEP.

#### CP/M-80 compatibility

**Baby Blue Conversion Software:** Microlog's famous Baby Blue Conversion turns CP/M-80 programs into PC-DOS programs for fast, efficient execution on Baby Blue II. Completely transparent operation using standard PC-DOS commands—freely mix PC-DOS with CP/M programs and text/data files on the same PC-DOS disks.

**Convert:** supports bidirectional file transfer between PC-DOS and popular CP/M disk formats.

**Keyfix:** automates your keyboard with 54 programmable function keys for CP/M programs, eliminating tedious typing chores (max. 80 characters per key).

Baby Blue II (64K installed) . . . . . \$ 695.

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# Financial Modeling in Micro Size



Micro/PROPHIT is the micro version of a time-sharing financial modeling language. In spite of a cumbersome model development procedure, it does have some useful features.

In the mid-seventies a company called The Service Bureau Corporation (SBC) introduced a time-sharing financial modeling language called *PROPHIT II*. This language was designed to allow executives in financial planning departments to solve business problems without having to program. It relieved managers of working through the often slow-moving backlog in internal data processing departments and provided a fast, efficient means of planning, analyzing alternatives, budgeting resources, and measuring profitability. *PROPHIT II* was

widely used and accepted from the beginning.

Via Computers, of San Diego, California, has now adapted this language for the PC in a package called *Micro/PROPHIT*. It allows companies to perform financial modeling analysis on a PC without incurring the high costs of time-sharing services.

According to Lee Ritze, vice president of marketing and development at Via, 20 to 25 percent of *Micro/PROPHIT* users have had experience with *PROPHIT II*. Via is also targeting the corporate plan-

ning staffs of Fortune 1500 companies.

## Micro/PROPHIT

My first impression of *Micro/PROPHIT*, however, was less than glowing, and I almost wrote this package off altogether because it is based on an antiquated model development procedure that requires the use of operation codes to define the model logic. This process is time consuming and makes the program unnecessarily cumbersome.

Nonetheless, *Micro/PROPHIT* can be a good choice in some situations, especial-

## MICRO/PROPHIT

ly if you are familiar with *PROPHIT II*. It allows you to port mainframe applications from time-sharing services to a PC.

*Micro/PROPHIT* uses a fill-in-the-table approach in model building that differs greatly from that of other financial modeling languages (see the example in Figure 1).

For more information about financial modeling languages, see "New Power for Constructing Financial Models" (PC, Volume III Number 15).

The following text from *Micro/PROPHIT*'s self-running demo will give you a firsthand idea of how this fill-in-the-table approach works:

*The first thing each line in the model must have is a line number. The use of line numbers avoids ambiguity and gives each function of the model a specific address.*

*Next we give the line a title. Because Micro/PROPHIT uses line numbers to establish logical addresses, you can use the same line title as often as desired, which is helpful when constructing large models. The next line element tells Micro/PROPHIT what action is to take place. This is done with an operation code. In Micro/PROPHIT the line-by-line actions that can be performed in a model have been preprogrammed and assigned an operation code. These codes are concise, flexible, and not subject to misunderstanding. And because their functions have been preprogrammed, a single Micro/PROPHIT operation code has the power to execute steps that would require several lines of code in most spreadsheet products.*

*Operation code 33, which is shown in*



### Micro/PROPHIT

Via Computer, Inc.  
7177 Construction Court  
San Diego, Ca 92121  
(619) 578-5356

Requires: 256K RAM, two disk drives.  
List Price: \$695

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Line#	Title	Op Code	P Index	L	Factors	Line References
10401	TOTAL SALES	33	2	1	1010, 1020	
:	:	:	:	:	:	:
:	:	:	:	:	:	:
:	:	:	:	:	:	:

**Figure 1:** This is the table format *Micro/PROPHIT* displays when you create a model. The procedure calls for first entering a line number, followed by a title for the variable being defined, followed by an operation code, printing index, line index, and, finally, by factors and line references needed to define the logic used to compute the variable.

*Figure 1, means add up to 15 lines. (Figure 2, shows the various operation codes available.) The next thing specified is whether or not the line will normally print on a report, and how many decimal places it will have when printed. This is done with a Print Index (P index for short). A print index of 2, like that shown in Figure 1 tells Micro/PROPHIT to print the line on a normal report with two decimal places. When entering a Micro/PROPHIT line, this entry can be skipped, and the Micro/PROPHIT default (which will print the values as integers) will be used.*

*The next piece of information that we provide tells Micro/PROPHIT how to total the line into the total column. Do we want to sum the values of the line, or do we want to put the value from the first column in the total column? In Micro/PROPHIT there are seven different line totaling methods. Like the P index, the L index can be skipped when entering the line, and the default value of 1, which sums the line, will be used. The final line entry is for factors and/or line references. In the example shown we've indicated with the operation code of 33 that we want to add some lines, so this is where we specify the lines to be added.*

*But what happens, you may ask, if you forget what to enter? With some products that's a problem, but not with Micro/PROPHIT. When you're running Micro/PROPHIT you can press F10 from practically anywhere within the program, and you'll receive a help screen that relates to what you are currently doing.*

*For example, if you were typing in the model line shown in Figure 1, and you*

*were in the op code field and you had forgotten what code was used to add lines, you could press F10 and you'd get the help shown in Figure 2. Every model needs an operation code to determine how its numbers are obtained.*

The developers of *Micro/PROPHIT* have gone to great lengths to show how easy it is to create a model. Although I agree that the model creation procedure is simple to follow and may be good for those who have little or no experience with financial modeling concepts, it can be an

**Micro/PROPHIT**  
does have some  
unusual enhancing  
features not found in  
most other financial  
modeling  
languages.

unnecessarily cumbersome and time-consuming process, especially as you gain experience in building financial models. A sample model in Figure 3 shows a completed model creation table.

### The Nicer Features

*Micro/PROPHIT* does have some unusual enhancing features not found in most other financial modeling languages. For example, the "goal-seeking" and "what-if" capabilities are simple for the novice

## MICRO/PROPHIT

financial modeler to use. The step-by-step approach used in these analyses makes it easier to grasp how these analytic concepts can be effectively used to investigate alternatives.

*Micro/PROPHIT* makes it easy to produce line item ratio reports. For instance, you can show all line items on an income statement as a percentage of sales. *Micro/PROPHIT* has a unique "plan difference display" that allows you to highlight differences in reports when comparing multiple scenarios. For example, you can ask it to show you the department names and the detailed line items in each department where all expense categories are more than 20 percent over budget.

*Micro/PROPHIT* has a "Difference Between 2 Reports" function that computes and displays the differences in a report produced under various what-if or goal-seeking analyses. *Micro/PROPHIT* displays the comparative differences in a report showing absolute or percent differences.

Even though the consolidation capabilities are advanced, they are relatively easy to use. *Micro/PROPHIT* allows postconsolidation recalculation of model logic. This feature solves the problems caused by interdepartment transfer transactions or situations caused when parent companies own less than 100 percent of divisions. These conditions come up frequently, so they need to be appropriately addressed in financial consolidations.

*Micro/PROPHIT* automatically will prompt you for the data required as input for the model, and it also will produce fill-in-the-blank data entry forms. The forms can be used to collect information about assumptions and raw input data for departments within your organization. Then, when large models are involved, these data entry forms can be used by clerical personnel to enter the data.

### Templates Models

Finally, the developers of *Micro/PROPHIT* have several template models available that were developed for *Micro/PRO-*

*PHIT*. According to Via Computer, experts in their respective fields designed these template models, and hundreds of major companies have used them to meet their planning needs. Some of the models available are

- Bank Planning
- Capacity Requirements Planning
- Capital Investment Analysis
- Corporate Analysis
- Credit Union Planning
- Lease Company Planning
- Lease vs. Buy Analysis
- Life and Health Insurance Company Planning
- Multi-Unit Retail Planning
- Property and Casualty Insurance Company Planning
- Residential Real Estate Development
- Savings and Loan Planning

As I mentioned, *Micro/PROPHIT* may

be a good choice if you have used and like some of the earlier versions of *PROPHIT II* or if you have a *PROPHIT II* application on a time-sharing service. It may also be a good choice if you are unfamiliar with financial modeling concepts, if you have not had any experience in developing financial models and if you strongly prefer menu-driven systems over command-driven ones.

Its take-me-by-the-hand menu-choice-upon-menu-choice approach is used extensively throughout *Micro/PROPHIT*. If you like menus and choices you should get your fill of them with *Micro/PROPHIT*.

Since you can purchase *Micro/PROPHIT* under a 30-day, money-back guarantee, I advise you to consider the product firsthand. I would not choose this product over some of the other financial modeling languages coming on the market for the IBM PC, but it may be just what you've been looking for. ■

Code	Purpose	Code	Purpose
40	Input from history/projection	34	Depreciation (in methods)
2	Add all lines within a range	37	Compound line by interest rate
33	Add or subtract up to 15 lines	36	Net Present Value
7	Subtract one line from another	50	Scheduled Factoring
12	Multiply a factor times a line	290	Internal Rate of Return
19	Multiply a factor times 2 lines	380	Growth rate
43	Divide 2 lines & mult. by factor	450	Loan Amortization
35	Divide a line by a factor	39	Break Level
3	Free-form Algebra, with up to 8 lines or constants	38	Negative Carry-forward
25	Skip 1 or more lines	23	Advance or defer date from another line
26	Line Title only	24	Iterative loop to attain convergence
27	Underline	4	Cumulate data in another line
30	Double Underline	3	Occulate data in another line
20	Copy another line	46	Link to another model definition
1	Copy 1 or 2 lines or a constant, based on If-Then-Else Test		
100	Choose a range of lines to execute		

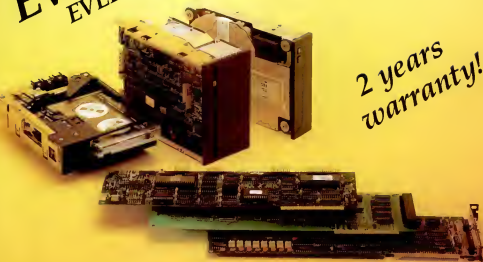
Figure 2: Operation codes used by *Micro/PROPHIT*.

Line/Title	10g	Code/IF	Ind/Li	Factors	line references
1000:1 INCOME	1	26	1	1	1
1010:1 SALES	1	40	1	1	111
1020:1 INTEREST	1	40	1	1	111
1030:1 UNDERLINE	1	27	1	1	1
1040:1 TOTAL SALES	1	33	1	1	121:1010, 1020
1050:1 SKIP 1	1	25	1	1	1
2000:1 EXPENSES	1	26	1	1	1
2010:1 PAYROLL	1	40	1	1	111
2020:1 COST OF GOODS	1	40	1	1	111
2030:1 UNDERLINE	1	27	1	1	1
2040:1 TOTAL EXPENSES	1	33	1	1	11:2010, 2020
2050:1 SKIP 1	1	25	1	1	1
2060:1 NET PROFIT	1	33	1	1	11:1040, -2040
2070:1 SKIP 1	1	25	1	1	1
2080:1 DOUBLE UNDER	1	30	1	1	1

Figure 3: Table describing the model logic for a sample *Micro/PROPHIT* model.

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# Making the Perfect MATCH

Matching your graphics controller card to your monitor is an important step before you buy. Today's high-performance graphics hardware offers you many variables to consider.

**C**hoosing a graphics controller card or color monitor is becoming more and more difficult these days as the graphics technology available for the PC becomes more sophisticated. You now have a choice among many hardware variables, including type of video signal, line rates, frame rates, bandwidths, image resolutions, color palettes, dot pitches, connector configurations, and phosphor options. As you wade through the specifications, you should not lose sight of one important point: the controller card's configuration must match that of the monitor it is to drive. If it doesn't, your monitor may simply not produce a picture—or it may, in rare cases, be damaged.

When making this match, you should not only consider the equipment you own now, but also the hardware you someday hope to own. A monitor or controller card that can be easily reconfigured to match a new, more sophisticated partner may be

worth an extra investment.

Let's assume that you're looking for an RGB (red, green, blue) monitor. These monitors are popular for a variety of advanced graphics applications, and they exemplify important issues in monitor selection.

## Types of Signals

Graphics controller boards (sometimes called "frame buffers") put out video signals carrying picture information and synchronization signals that position the image on the monitor. They produce one (or both) of the two types of RGB video signals: RGB TTL or RGB analog.

You have already used RGB TTL signals if you've used an IBM Color/Graphics Adaptor. TTL (Transistor-Transistor Logic) means that the RGB signal levels are digital (either on or off), and that they conform to standard TTL voltage levels. An RGB TTL signal supports 8 colors. If the board includes an additional bit for intensity (as the IBM color graphics card does), then the 8 colors will be available in both high- and low-intensity, which

## PERFECT MATCH

makes a total of 16 colors. This 16-color arrangement is often designated as RGBI TTL (the I stands for intensity).

To go with boards that send a TTL signal, you will need a TTL input monitor. A TTL input monitor has video amplifiers designed for discrete (digital) input levels.

In operation, the monitor first accepts the TTL signals from the graphics controller board. Next, it routes the signals to the video amplifiers, where they are increased in voltage to drive the CRT; the corresponding red, green, and blue CRT electron guns will turn on and off in combination to create 8 or 16 possible colors.

Most popular RGB monitors available for the IBM PC do accept the intensity signal. However, you can still use an RGB monitor that doesn't accept an intensity signal with an RGBI graphics controller board; it will simply ignore the intensity signal and display only a single-intensity, 8-color palette.

One point to check is whether the monitor uses the IBM PC color set, which includes a brown. A TTL monitor that uses this set must have special circuitry to alter the CRT gun levels so that high-intensity yellow displays as brown.

If you are using the monitor for business graphics or computer-aided design, an RGBI monitor's 16 colors may be enough. For sophisticated solids modeling, animation, or image processing, however, you might want a wider color range. To get a wider range, you'll need a graphics controller board that puts out *analog* video signals and a monitor that can accept them.

### Analog

Analog signals differ from TTL signals in that the RGB signal voltage levels can vary continuously to produce an almost unlimited range of colors. The actual analog color palette, however, is limited by the display memory and other hardware capabilities of your particular graphics controller board. Most analog graphics controller boards currently on the market for the IBM PC produce color palettes

ranging from 16 to 256 simultaneous colors. If the board includes alternate color choices on a "color look-up table," then you may pick your simultaneous colors from a possible palette of either 256, 4,096, or 16,000,000 hues.

It's important to realize that if you do choose a graphics controller board that delivers analog signals, you must use an analog input monitor. Analog input monitors have linear amplifiers capable of handling continuous changes in voltage levels and a theoretically infinite number of colors. The intensity of the CRT electron beam is proportional to the voltage applied to the video inputs.

### Keeping Your Options Open

Obviously, you need to choose the type of signal you want to use before you buy a monitor. However, if you're working with TTL signals now but may need to switch to analog in the future, you may not necessarily need two monitors.

While digital monitors tend to be less expensive than analog, you may wish to keep your options open by purchasing an analog monitor that has been modified to accept TTL signals. Most analog monitor vendors can make the change for you when you purchase the monitor, but you may have to ship it back to the factory later to change it back to analog (unless you know how to do it yourself). A few models offer user-replaceable TTL and analog input modules; yet others are configured to accept either type of input.

If you know a little about electronics, another option is to build a simple circuit adapter to convert your controller board's TTL signal level to one acceptable to analog input monitors.

### Video Frequencies

Once you've chosen your video signals, you'll need to consider the frequency and synchronization signals you'll be using to send video signals to the monitor. One job of the graphics controller board is to read pixel data from the display memory in parallel and then to shift it serially to

the monitor. A *dot clock* controls the timing. You have to consider three important timing specifications when you match your board to the right monitor: horizontal frequency (line rate), vertical frequency (frame rate), and video bandwidth (pixel rate).

The horizontal frequency, or line rate, is that required to display complete lines of

Manufacturer	Model #
Electrohome	1301
Aydin Controls	8810.88.30
Amtron	CD Series
Tandy	26-5112
Barco Industries	CD233
Barco Industries	CDCT 5100
Barco/Elector, Inc.	PCD
Gigatek	1331
Gigatek	1321
Amdek	Color 700/710
Amdek	Color 725
Amdek	Color 600
NEC	JC-1410P2(A)
Quadchrome	CH8400
Taxan	RGBvision 420
Zenith	ZVM 136
PGS	SR-12
PGS	HX-12
Roland	CC141
IBM	Color Display
Ikegami	CD Series
Hitachi	HM-2713/2719
Motorola	CM-4005
Conrac	7211

Figure 1: Specifications for a sampling of



# PERFECT MATCH

pixel information (including the horizontal retrace period). Vertical frequency is the rate at which entire frames are refreshed (including the vertical retrace period). Bandwidth is the frequency at which individual pixels are displayed. It takes into consideration line rate, horizontal blanking period, the number of pixels to be stored on each raster line, and a few other

variables. What is important is to choose a monitor bandwidth greater than or equal to that of the graphics controller board you are considering.

How are video frequencies chosen? The frequencies most commonly used are those that conform to the United States television broadcasting standard, that is, 15.75 kHz horizontal and 60 Hz vertical.

A graphics controller board that conforms to this standard can be used with a wide variety of affordable RGB monitors, as well as with television sets.

The IBM PC color graphics card delivers these standard frequencies, but the card is, unfortunately, limited to 640 × 200 pixel resolution. If you need more you have two options. You can find a graphics

Screen Size (Diag) (inches)	Dot Pitch (mm)	Horizontal Scan Rate (kHz)	Video Bandwidth (MHz)	Standard Input Signal	Sync on Green	Separate Sync	Phosphor Options	Approx. List Price \$
13	.31	14.5 to 25.5	25	Analog	Yes	Yes	LP**	1,800
13/19	.31	15 to 18.5*	25	Analog	Yes	Yes	SP*** or LP	NA
		18.5 to 21.5						
		21.5 to 25						
13/19	.31	14 to 24*	100	Analog	Yes	Yes	SP or LP	3,700
		25 to 39						
14	.31	26.4	30	RGBI TTL	-	Yes	SP	799
13	.31	15.75	15	Analog	Yes	Yes	SP or LP	1,500
13/19	.31	15 to 26.5	25	Analog	Yes	Yes	SP or LP	4,500+
16	.31	15.75	16	Analog/TTL	Yes	Yes	SP or LP	975
13	.31	15 to 40	40	Analog	Yes	Yes	SP or LP	1,450
13	.21	15 to 40	40	Analog	Yes	Yes	SP or LP	2,050
13	.31	15.75	18	RGBI TTL	-	Yes	SP or LP	749-799
13	.31	25	25	Analog	Yes	Yes	SP	850
13	.43	15.75	15	RGBI TTL	-	Yes	SP	649
14	.31	24.8	25	RGB TTL	-	Yes	SP	998
12	.31	15.75	15	RGBI TTL	No	Yes	SP	795
12	.38	15.75	18	Analog/TTL	No	Yes	SP	649
13	.43	15.75	20	TTL	-	Yes	LP	799
12	.31	27.5 to 31.5	25	RGBI TTL	-	Yes	SP	799
12	.31	15.75	15	RGBI TTL	-	Yes	SP	695
14	.42	15.75	18	Analog/TTL	No	Yes	SP	799
13	.43	15.75	14	RGBI TTL	-	-	SP	680
14/20	.31	15.75*	40	Analog	Yes	Yes	SP or LP	1,989+
		24.2						
		32.63						
13/19	.31	15 to 18	25	Analog	Yes	Yes	SP or LP	NA
14	.31	21	22	Analog	Yes	Yes	SP or LP	1,100+
13/19	.31	15 to 37	40	Analog	Yes	Yes	SP or LP	3,730+

\*range configured from factory \*\*long persistence \*\*\*short persistence

high-performance graphics controller boards.

## PERFECT MATCH

controller board that doubles the vertical resolution to 400 or more lines, yet is still compatible with standard scan rate monitors. To accomplish this it must use what is called an interlaced scan. Or, you can find a board that doubles vertical resolution without resorting to interlacing. Such a board puts out nonstandard scanning frequencies.

### Interlacing

If you opt for the route that uses interlacing, you'll want a board configured for 15.75 kHz and 60 Hz that has a video controller chip programmable for an interlaced scan. With this approach, you'll get double the number of vertical lines, but they will be refreshed as two separate

expense of halving the effective vertical refresh rate. The problem is further compounded by the high contrast in which computers display objects; this contrast makes the slower refresh apparent to the human eye.

The only way around this problem is to use a monitor with long-persistence phosphors. However, these special phosphors in themselves create problems: a displayed image may smear as it moves on the screen, and the slow phosphors usually make the overall image dimmer.

### Nonstandard Scan

A second alternative for better resolution is to find a graphics controller board and a monitor that offer 400 or more lines of resolution without interlacing by using nonstandard scan rates. Horizontal frequencies of 21 to 25 kHz are in the ballpark for  $512 \times 512$  pixel noninterlaced resolution, 25 to 30 kHz for  $1,024 \times 1,024$  pixels.

The advantage to the high-scan-rate approach is a possible resolution of 400 or more lines without the need for interlacing or long-persistence phosphors. Furthermore, if needed, these monitors may be interlaced for another doubling of their resolution. Unfortunately, high-scan-rate monitors require expensive components that traditionally have kept their price tags out of PC range. Recently, however, companies such as Amdek Corporation, Princeton Graphic Systems, Tandy Corporation, GIGATEK Limited, and Aydin Corporation, have begun offering high-scan-rate monitors at affordable prices.

Another drawback is that these monitors are not compatible with the IBM PC color graphics board and software.

However, vendors such as Vectrix and Persyst (Personal Systems Technology) are now offering graphics controller boards with special features that run PC-compatible color graphics software on high-scan-rate monitors. PGS (Princeton Graphics Systems) has announced a "scan doubler," an additional board that acts as an intermediary to make a standard PC

fields composed of the odd and even scan lines. Because each of the fields is refreshed in successive 1/60's of a second, this approach gives the monitor an effective vertical refresh rate of 30 Hz. The advantage of interlacing is that you can still use standard scan rate monitors. If your graphics controller board puts out TTL signals, you can even get by with the same RGB monitor that's compatible with your IBM color graphics card. You might not need a separate monitor.

The disadvantages of interlacing include an annoying flicker when displaying 400 or more interlaced lines. Interlacing doubles the vertical resolution at the

Manufacturer	Model #
Amdek	MAI
Tecmar	Graphic Master
Conographics	Cono-Color Adapter
Scion	PC640
Control Systems	Artist I
Control Systems	Artist II
Number Nine Engineering	NNGS Revolution
Vectrix	Midas
Persyst	BOB

Figure 2: Specifications for a sampling of

color graphics board compatible with high-scan-rate monitors. As high-scan-rate monitors become more affordable, graphics board vendors are more eager to support them.

### Vertical Scan

Vertical-scan rates can vary as well, although 60 Hz is common, even with fast horizontal scanning. A board manufacturer may choose a lower vertical-scan rate such as 50 Hz to increase resolution. However, the slower refresh rate is more likely to cause flicker, particularly if an interlaced mode is used, so that the effective refresh rate is slowed to 25 Hz. A faster vertical-scan rate, such as 70 or 80 Hz, might reduce the resolution somewhat, but the image is more likely to be rock steady if it is interlaced.

Many monitors designed for 60 Hz vertical scanning will work at 50 Hz or 70 Hz without modification. With others, it's a good idea to check with the vendor, who may be able to customize the monitor if you specify, when ordering, the vertical frequency you need.

The designs of the IBM color graphics and monochrome cards illustrate the trade-

# PERFECT MATCH

CRT Controller	Graphics Memory (kibibytes)	Horizontal Scan Rate (kHz)	Vertical Scan Rate (Hz) (Noninterlaced)	Video Bandwidth (MHz)	Signal Type
MC6845	128	15.75/18.4	60/50	18	RGBI TTL
MC6845	128	15.75/18.4	60/50	18	RGBI TTL
MC6845	128	15.75/21	60,72,80	16	RGBI TTL, Analog
MC6845	256	15.75	60	16	RGBI TTL, Analog
NEC 7220	512	up to 30	60	40	Analog
NEC 7220	128	up to 24	60	25	RGBI TTL, Analog
NEC 7220	256	*	*	*	*
NEC 7220 MC6845	384	22.5	82	25	RGBI TTL, Analog
MC6845	16+	26	60	26	RGBI TTL

\*configured from factory to purchaser's specification

## high-performance monitors.

offs that must be made in choosing frequencies. The Color/Graphics Adaptor uses 15.75 kHz horizontal and 60 Hz vertical frequencies so that it is compatible with low-cost color monitors and television sets. Its maximum resolution is 640 × 200 pixels. The Monochrome Adaptor, by contrast, scans at 18.35 kHz and 50 Hz. Its faster horizontal rate and slightly slower vertical rate give it sharper resolution (750 × 350 pixels) for text characters. The nonstandard scan rates are practical for monochrome monitors because monochromes are much less expensive. Because of the 50 Hz refresh, IBM chose a long-persistence phosphor even though the monochrome card operates in a noninterlaced mode.

Tandy made different choices when designing its new Tandy 2000 computer, which takes advantage of affordable fast-scanning RGB monitors. Its color graphics controller is designed to operate with a 22 kHz monitor for 640 × 400 pixel noninterlaced resolution.

Many monitor vendors ask you to pick specific horizontal- and vertical-scan frequencies when ordering a monitor. However, if you're unsettled about future scan

rates you'll be using, relax. Some vendors, such as Electrohome USA, Ltd., GIGATEK, and Barco Industries, offer monitors with user-adjustable scan rates so that you can easily adapt the monitor to a variety of uses.

It is the phosphor persistence rate that you select initially that you'll have to live with; changing phosphors means replacing the CRT.

Many graphics controller boards are programmable: within certain limitations they can put out several different combinations of scanning frequencies. You can sometimes further customize your board by changing its timing oscillator, but you must find out from each board's manufacturer whether this is possible. Either of these techniques offers you flexibility in matching a monitor; however, a board vendor may only support one or two fixed-scan-rate combinations. Deviation from those could mean that you'll have to create your own graphics primitives and application software from scratch.

## Dot Pitch

The CRT's internal dot pitch, the spacing of RGB dot trios near the CRT sur-

face, is another important feature to consider. Ideally, there should be at least as many dot trios along a horizontal line as there are horizontal pixels sent by the controller board. The spacing between dot trios will depend on the CRT size or, more specifically, the CRT active area.

On a 13-inch monitor with a horizontal active area of 240 millimeters, if the frame buffer delivers 720 horizontal pixels the monitor will need spacing between dot trios of at least .33 millimeters (240 millimeters ÷ 720 pixels). The image can still be displayed if the dot spacing is larger, but for optimum image clarity the spacing should meet the standard. As you might expect, finer dot spacing increases CRT costs.

## Cables

Most popular RGBI TTL monitors use a PC-compatible 9-pin connector for display and sync signals. However, many analog input monitors not specifically designed for the PC market have separate connectors for each signal. Some connectors have a "loop through" feature and a termination switch that help you to drive several monitors simultaneously from the

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### PERFECT MATCH

same graphics controller board.

Sync signals are sometimes placed on a conductor separate from the video signals; another popular arrangement combines the vertical and horizontal sync signals

If possible, try the same scanning rates you'll be using before you buy.

with the green video signal. For greatest flexibility, you should get both a monitor and a frame buffer that can be configured for either type of operation.

### Matchmaking

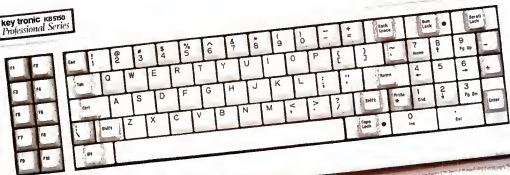
Figure 1 lists specifications for several high-performance graphics controller boards for the PC. Figure 2 lists monitor specifications. Use these two tables as a guide, but remember that all specifications shown are derived from manufacturers' literature, not from actual use.

When you are trying out high-performance monitors in the store, test them the same way you might test less-expensive units. To test convergence, try filling the screen with white characters on a black background, then look towards the corners of the screen. No color fringes should be apparent on any of the characters. Make sure that horizontal and vertical lines are straight. If possible, try before you buy at the same scanning rates you'll be using. Be sure that any apparent flicker is tolerable. Flicker is more noticeable on single lines than filled areas. Red usually has the longest persistence, blue the least.

Many vendors vary the specifications they use to describe their products. The more aware you are of the interrelationships of frequencies, bandwidths, and pixel resolution, the better you'll synchronize your graphics hardware.

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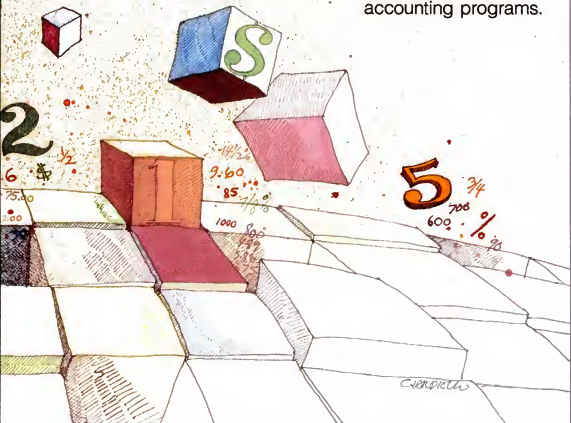
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THE PRICE WATERHOUSE REPORT

# Exploring The Profit Center

The Profit Center family of integrated business software from Prentice-Hall includes straightforward and well-documented accounting programs.





## PROFIT CENTER

**W**ith the recent explosion in the market for PC-based accounting software, a number of prominent names are jumping onto the bandwagon. Prentice-Hall, the long-time book publisher, is a name familiar to most of us, but not as a supplier of software. Yet the company is now mounting an aggressive campaign to publish and market an extensive series of integrated business software for the PC-XT, including the three accounting packages discussed here.

Prentice-Hall's Profit Center software family will ultimately comprise a total of 21 modules, as follows:

### *Master Menu*

*General Accounting*

*Accounts Payable*

*Accounts Receivable*

*Business Word Processor*

*NEAT: The Time and Information Manager*

*Payroll*

*Wholesale Inventory*

*Retail Inventory*

*Manufacturing Inventory*

*Personal Accounting*

*Report Generator: Financial*

*Accounting*

*Job Estimator*

*Job Cost and Control*

*Business Project Organizer*

*Calculator*

*Spread Sheet*

*Spellproof*



### *Mailing List*

*Data Base Manager*

*Report Generator: Data Base Manager*

All of these packages are being developed by Orchid Software, Inc., of Austin, Texas. As of June, only the first six modules listed above were available. We examined and will discuss the *General Accounting*, *Accounts Payable*, and *Accounts Receivable* modules. Prentice-Hall expects to have all of the additional packages completed by the end of 1984, at which time the Profit Center will be one of the very few full lines of integrated business and productivity software.

### **Master Menu**

In order to install any of the Profit Center applications, you must first install the Profit Center *Master Menu* system, which Prentice-Hall describes as an "application environment." The *Master Menu* includes a host of system maintenance routines to help you install and maintain your Profit Center applications. Additionally, its structure allows all the modules to adhere to uniform commands and procedures. This is particularly important if you begin using the limited subledgers built into the *General Accounting* package and then later want to upgrade to one of the full-featured subsidiary systems such as *Accounts Receivable*.

### **General Accounting**

The Profit Center's *General Accounting* module offers a general ledger and financial reporting capability as well as a limited ability to maintain customer, vendor, employee, and payee records. We'll discuss briefly what this system provides in the way of subsidiary system reporting for customers and vendors. Then we'll describe the Profit Center's standalone *Accounts Payable* and *Accounts Receivable* modules.

The heart of the *General Accounting* system, the general ledger, contains those routines needed to maintain the central accounting records. You can establish your own chart of accounts (though the system does contain a default chart for your convenience), enter general journals, post these entries to the general ledger, close the books, and print reports and financial statements.

### **The Chart of Accounts**

When evaluating a general ledger system, the first thing you want to examine is the size and structure of the chart of accounts' coding scheme. Much of the flexibility and/or limitations of the system will then become apparent. The chart of accounts is structured as follows: NN - NNNN. This represents a 2-digit division code, followed by a 3-digit natural account (object) code and a 1-digit depart-



### **The Profit Center**

Prentice-Hall, Inc.  
200 Old Tappan Rd.  
Old Tappan, NJ 07675  
(201) 592-2000

**List Price:** *Master Menu*, \$25; *General Accounting Module*, \$595; *Accounts Receivable Module*, \$695; *Accounts Payable Module*, \$695.

**Requires:** 128K RAM, PC-DOS, 80-column display, two disk drives.

CIRCLE 754 ON READER SERVICE CARD



## General Accounting offers a general ledger and financial reporting capability as well as a limited ability to maintain customer, vendor, employee, and payee records.

ment code. In addition, a 3-character code identifies each company you wish to process with the system.

You can establish up to 99 distinct divisions. If you do set up multiple divisions, you'll have to enter initial balances for the balance sheet accounts (asset, liability, and equity accounts) for each division. Each division's financial records must be in balance. This is a notable requirement because many accounting systems that provide for divisional reporting *do not* require this—instead, only the accounts for the entire company must be balanced. All divisions must use a common chart of accounts.

If you set up multiple divisions, you can obtain independent financial statements for each division. Be aware, however, that this capability will probably increase the number of accounting entries you must make, since you have to group and enter transactions by division and you can't allocate amounts across divisions. However, a special function is included to facilitate interdivisional transfers. As the system documentation suggests, this capability is ideal for a multistore or multilocation business in which you want to measure the financial performance of each independent entity and then consolidate their financial transactions.

You can also establish up to nine departments, but only income and expense

items can be reported separately; for example, you cannot report, independently, a department's balance sheet. However, you can report profit or loss by department, and this lets you summarize the profitability of individual departments, services, or product lines.

It is important to note that, even when multiple divisions or departments are used, a single customer list, vendor list, employee list, and payee list are maintained for the company.

A function for repetitive entries is included to allow you to set up recurring journal entries that can be called up each time they're needed. This is a handy feature for recording depreciation, bank service charges, lease payments, and the like.

### Subsidiary Ledger Reporting

When you set up your system, you're given the option of establishing subledgers for customers, vendors, employees, and payees (for regular cash disbursements). Further, you can elect to enter and maintain addresses within each subledger. Though the documentation refers to these

options as "accounts receivable," "accounts payable," and "payroll," you should not assume that the *General Accounting* module will provide anything close to the capability of standalone systems for these accounting functions. What the subsidiary ledgers do provide is a handy means of tracking the dollar volume of sales made to customers, their payments made to you, the amounts you've been invoiced by your vendors, the payments you've made to vendors, and the amounts you've paid to your employees.

Figures 1 and 2 illustrate the use of the customer subledger with the *General Accounting* module. Figure 1 depicts the screen on which you enter customer invoices and refunds—that is, debits to the customer subledger. Figure 2 depicts the screen on which you enter collections (payments) from customers. The system functions as a very basic "balance forward" accounts receivable system. There is no attempt to match customer payments to specific invoices. However, a listing of the "accounts receivable" subledger is available to help you track customer balances. (continued)

111 - ENTER CUSTOMER INVOICES & REFUNDS						
Invoice Number	Invoice Date	Customer Number	G/L Acct#	Name		Credit Amount
1087	6/13/84	1		Rosner Distributors		
			4010	SALES		2020.00
			2030	SALES TAX PAYABLE		23.00
				Invoice Total		2043.00
1088	6/13/84	2		Lippincott Construction		
			4010	SALES		1156.00
			2030	SALES TAX PAYABLE		0.00
				Invoice Total		1156.00

Figure 1: A view of the screen used by the General Accounting module to capture customer billings or refunds.

112 - ENTER COLLECTIONS FROM CUSTOMERS						
Invoice Number	Receipt Date	Customer Number	G/L Acct#	Name		Debit Amount
1088	6/13/84	2		Lippincott Construction		
			1020	CASH ON DEPOSIT		1000.00
				Collection Total		1000.00
987	6/13/84	3		Anastasi Furniture, Inc.		
			1020	CASH ON DEPOSIT		3390.45
				Collection Total		3390.45

Figure 2: This screen records cash receipts from customers when you use the General Accounting module's customer subledger.

## PROFIT CENTER

The vendor subledger functions in exactly the same manner. You can track amounts due to individual vendors, but the system does not support the management of disbursements as a comprehensive accounts payable system would. The employee subledger, in turn, allows you to accumulate amounts paid to and withheld from employees. It does *not* assist you in calculating your payroll.

As you enter transactions affecting these subsidiary ledgers (billings, cash receipts, and so on), you enter appropriate general ledger account distribution codes that can then be automatically posted to the general ledger. One very handy feature allows you to look up the identification numbers of customers, employees, vendors, or payees simply by typing in their names. You access this capability in a window that pops up as you enter data.

### Setting Up the General Accounting System

Setting up the system is very straightforward and, apart from the time it takes you to organize your existing records and design a proper chart of accounts, should take you no more than a day. A data collection form is supplied with the documentation to aid you in organizing your records. In fact, an entire section of the documentation is dedicated to helping you establish proper accounting records.

### General Accounting System Reports

The reports available from the *General Accounting* system provide you with a good audit trail and summaries of your transactions. Journal (transaction) listings and ledger detail listings are available for each of the subledgers, as are simple lists of your customers, vendors, employees, and payees. A general ledger trial balance, chart of accounts listing, and financial statements (balance sheet and income statement) are available, and you can produce customer statements and checks as well. You can even customize the format of your statements, checks, and check

Figure 3: This Accounts Payable screen helps lead you through the process of activating a new subsidiary ledger. This procedure is performed only when setting up your books.

stubs. One very unusual aspect of the system reports is that they are all set up to use an 80-column printer. Most comparable systems require a 132-column printer for producing reports.

### Accounts Payable

Let's say you've been using the Profit Center *General Accounting* package for a while and your business has grown in size. You are now dealing with a larger number of vendors for the purchase of supplies, services, and inventory. It would then be

process. There was, in fact, little need to refer to the documentation in performing this task.

Once you've installed the *Accounts Payable* module, you won't be able to make vendor and payee payments from within the *General Accounting* package—if you try, the system will stop you and direct you to use the *Accounts Payable* module. (Incidentally, this also holds true when you install any of the other subsidiary ledger packages.)

The *Customize Accounts Payable* menu selection allows you to maintain vendor and/or payee information such as name, number, address, and terms. In addition, the system allows you to keep a screen full of textual information for each vendor. This unique feature is helpful for making free-form notes on each vendor that you can call up through the system's vendor-inquiry capabilities. For example, you might want to note such information as shipping terms, the number of days that a check written to this vendor normally takes to clear your bank, the preferred carrier for shipments, and other information that might come in handy. This feature is unique among PC-based packages and represents an improvement over the conventional vendor-information fields used by most accounting packages.

Setting up the system is very straightforward and should take you no more than a day.

useful to have more detailed information available on your vendors, purchases, and disbursements so that you can effectively manage your cash flow. The Profit Center makes it easy for you to install the *Accounts Payable* module through the *Master Menu* and to activate a new subsidiary ledger. Figure 3 shows the screen that leads you through this straightforward

First Office Corp.									
RE OF 5/12/84									
VENDOR HISTORY									
ALL ITEMS WITH A01 STATUS									
VENDOR NUMBER	REF NUMBER	DESCRIPTION	DATE	STATUS		BALANCE INCREASE	BALANCE DECREASE		
A CITY OFFICE SUPPLY									
2	C - 4484	CREDIT MEMO	1/28/84	C 3			148.58		
		DISC OFFERED	1/28/84			2.81			
	61085	DISC CREDIT	1/25/84				2.81		
	61085	PURCHASE	1/25/84				148.58		
		Net Unassigned						8.00	
Explanation: DUNNAGE GOODS									
2	C - 4483	61085 PURCHASE	1/25/84	O 3		1,582.25			
		DISC OFFERED	1/25/84				30.42		
		CREDIT MEMO	1/28/84				2.81		
		CREDIT MEMO	1/28/84				148.58		
***** Screen Keys Active. Press ESC to Exit *****									

**Figure 4:** This report screen shows part of the history for a vendor. The level of detail can be varied over ranges of vendors, dates, transaction periods, types of items, and status of items. 1. This line indicates that all items that have been assigned a status should be displayed. 2. The C indicates a current period item. 3. This code indicates whether the item is open (O), held (H), or closed (C).

BSL - CUSTOMIZE COMPANY CHECKS    NOTES: LINES NOT TO SCALE, SEE DOCUMENTATION.

Line	Column	Print	Item	Description
1	54	Y	CHECK NO.	_____
18	58	Y	DATE	_____
18	58	Y	AMOUNT, NUMERIC	_____
8	6	Y	AMOUNT, TEXT	_____

-----

COMPANY NAME \_\_\_\_\_ CHECK NO. \_\_\_\_\_

COMPANY NAME ADDRESS LINE 1 \_\_\_\_\_

COMPANY NAME ADDRESS LINE 2 \_\_\_\_\_

AMOUNT, TEXT \_\_\_\_\_

DATE \_\_\_\_\_ AMOUNT, NUMERIC \_\_\_\_\_

PAY TO THE ORDER OF NAME \_\_\_\_\_

PAY TO THE ORDER OF ADDRESS \_\_\_\_\_

**Figure 5:** This is a sample of a preformatted layout for a document to be printed—here, a check to a vendor. The location of data elements, such as check number, can be varied by changing the line and column designations.

When you're setting up your accounts payable records, you can choose between the "discounts lost" and the "discounts taken" accounting methods. Your choice depends on whether you ordinarily take or forego cash discounts in the payment of your bills. The system's documentation thoroughly discusses this process and the financial reporting impact of each alternative.

The processing of vendor transactions

is relatively straightforward, with screen prompts and error messages guiding you along the way. You can selectively pay certain vendors, as well as create automatic vendor payment schedules for recurring payments. Cash disbursements can be processed for "immediate" payment so you can bypass the formal booking of an account payable in such cases. Similarly, you can record manually prepared checks. Vendor history is maintained by the sys-

tem and is available from a screen like the one shown in Figure 4.

The package includes a sample format for your checks. If this format doesn't suit you, it can be reconfigured to accommodate most commonly used check formats. Figure 5 shows the screen for designing the check format.

The Profit Center Accounts Payable module provides a typical array of reports to help you manage your vendor payments. A check register, a cash requirements report, an aged trial balance, and vendor analyses are available. The vendor analyses include a summary of year-to-date statistics, vendor profiles, and vendor terms; these reports can be sorted by vendor name or number. As with the General Accounting package, all reports are printed on 8½-by-11-inch paper.

One notable feature of this package is that account distribution data are passed to the general ledger in detail, not summarized, as in most comparable accounting packages. This can sometimes clutter the general ledger with unnecessary detail, but it augments the audit trail and aids in the detailed analysis of accounts within the general ledger.

## Accounts Receivable

The Accounts Receivable module enables you to manage your customer accounts as your firm grows in size beyond the capabilities of the customer accounting facilities of the General Accounting package. The installation and initialization of the Accounts Receivable package parallels that of the Accounts Payable module. The menu structure is also very similar. This will allow you to get the Accounts Receivable package up and running in no time at all.

At the time you set up your Accounts Receivable system, you'll be faced with making several decisions regarding finance-charge methods, discount terms, collection-tracking methods, and aging increments. We found the documentation and associated system routines to be quite comprehensive in explaining your options

## PROFIT CENTER

and allowing you to select the parameters that best suit your business requirements.

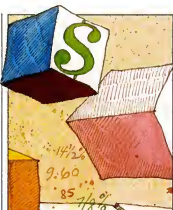
You use an input screen such as the one shown in Figure 6 to establish your customer files. You can store a considerable amount of useful information on each customer; note your ability to flag whether a customer has a habit of using "hot checks" (checks drawn against insufficient funds).

You also have the option of specifying whether payments on an account will be maintained on a "balance-forward" or an "open-item" basis. When using the balance-forward method, payments are first applied against the oldest outstanding invoices until the balance is reduced to zero or a credit balance occurs. The open-item method allows you to specify individual invoices to be recorded as paid. While this method is often preferred by those in business, it is a bit more complicated. If you run a small business and you need to track amounts owed to you on a detailed (open-item) basis, go ahead and do so, but try to avoid it if it's not really necessary. A record-keeping nightmare can result if you use an open-item approach to tracking receivables, while your customers are paying on the basis of total (or partial) balance due.

### Other Features

In addition to processing invoices, collections, and credit memos, customer accounts can be adjusted using the General Journal Adjustments function. Sample formats are included for invoices and statements, which you can also customize if you wish. Another handy feature is the ability to establish repetitive billing data to help speed the billing of your regular customers.

Perhaps the most useful feature of any receivables system is the ability to generate timely reports to monitor amounts due from your customers accounts. The Profit Center Accounts Receivable system provides reports for customer analysis, sales tax analysis, finance charge analysis,



salesperson analysis, and customer profiles.

In producing the customer-analysis reports, you have the option of sorting by days delinquency, over credit limit, hot check status, billing cycle, customer category, or customer status. The sales tax analysis report allows you to sort out your tax-exempt customers for review purposes. The finance charge analysis will report on accrued finance charges and customers for whom finance charges are waived. The salesperson analysis is avail-

able on a detailed (sale-by-sale) basis or in summary. Finally, customers' profiles and histories can be reported at various levels of detail. Customer profiles contain free-form textual notes similar to those in the vendor profiles discussed under the Accounts Payable system.

### Menus and More

Like virtually all accounting software, the Profit Center systems use a hierarchy of menus to guide you through the individual accounting functions. The Profit Center's menus are well-organized and understandable. To select an option using a menu, you simply enter the number assigned to the option you wish to use; this calls up the next (lower-level) menu where you again select the function you wish to use. However, you can use an alternative method of initiating your accounting functions as you become more familiar with the system—when using any menu, you can enter your choice for the current menu and all lower-level menus for immediate access to the accounting function you wish to use. This procedure provides you with both the clarity of a menu-driven system and the speed and convenience of a command-driven system.

641 - EDIT CUSTOMER ACCOUNTS		CUSTOMER NUMBER RANGE		1 TO 9999 1	
Action	Number	Customer Name	Tax Exempt (Y/N)	Exempt Number	Exempt Date
Actions Available					
When Editing	1	Zubrovsky, Mark	N		
Bill	2	Holinger, Eric	Y	127045	
Change detail	3	Brown, Harold	N		
Diagnose					
Send details					
*HIGHLIGHT KEYS ACTIVE*					
Account Type (Set Fed, Open): B	Station (Active, Inactive, Suspended): B				
Credit Rating: D	Billing Cycle (9-21): F	Category (10-21): B			
Finance Charge (Y/N): N	Send Statement (Y/N): Y	Hot Check (Y/N): Y			
Credit Limit: 1234.56	Charge Not Used (Current):				
YTD - Times Billed: 12 Times Past Due	4 Finance Charges: 1234.56				
Life - Times Billed: 23 Times Past Due	6 High Balances: 12345.67				
Address Info Form		Address: 214 Marland Heights Dr.			
Harold Brown		City : Harvard State MI Zip 48953			
		Phone : (313) 723-4187			

Figure 6: This customer account Edit screen allows you to scroll through your customer list and selectively change any of the details related to an account. 1. You can specify a range of account numbers to be displayed at any given time. 2. These parameters can be altered to suit your own information needs. 3. This summary information gives you a useful profile of a customer's account status.

## Integrity and Security

Many accounting systems, for reasons of efficiency, maintain certain indexes or "pointers" in memory or on disk. The integrity of these indexes is fundamental to the proper functioning of the system. If you're using such a system when a power outage occurs and your PC stops functioning, a great deal of data may be lost. Although the Profit Center systems use this method to organize accounting records, they also include routines that automatically alert you if a system failure

## The Profit Center systems use a hierarchy of menus to guide you through the individual accounting functions.

has occurred and automatically repair the damage so that a minimum of data is lost. In fact, such a failure did occur during testing, and the damage was neatly repaired in a matter of seconds. In fact, the only data lost were the two records that were on the screen at the moment the power went off.

Using routines provided with the Master Menu system, you can establish a relatively sophisticated matrix of security codes. A three-character password can be assigned to each individual with access to the system. You can thus establish which individuals can gain access to which accounting functions.

## System Integration and Documentation

Prentice-Hall plans to provide full integration between all Profit Center applications. We tried it out by calling up the accounting systems' reports on the Profit Center's Business Word Processor. This

capability would allow you to, say, send a form letter to all of your customers, vendors, employees, or payees (if you maintain their addresses in your subsidiary ledgers).

The developers have made a major effort to help you become familiar and comfortable with the software. The documentation contains a tutorial exercise that guides you step by step through a number of the systems most important functions. A tutorial disk is included with sample data keyed to the tutorial exercises and exhibits.

In addition to the learning exercises in the manual, a General Accounting "Learning Kit" is provided, with its own set of exercises, a practice disk, and an audiotape with step-by-step instructions on how to use the system properly and to the best advantage.

The hardcover manual is quite complete with a good index and many useful illustrations. Many of the video screen exhibits, however, could use additional illustrative data.

## Parting Remarks

Several other points regarding Prentice-Hall's approach to this new product line bear mentioning. First, the company will publish a Profit Center newsletter with useful information on enhancements, training, support, and software patches that can be made via a utility in the Master Menu package. Also, the Profit Center applications will be included in the recently announced IBM PC Apprentice Series of software that will be available to universities and secondary schools beginning this fall. School systems will be able to order the software and tutorial books at discount prices.

The Profit Center accounting applications represent a good effort on the part of Orchid Software and Prentice-Hall to integrate basic accounting tools into a full line of business software. The systems we reviewed are straightforward and well-documented, with well-designed screens and reports.—G. William Dauphinais

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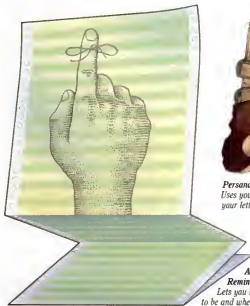
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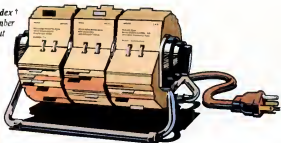
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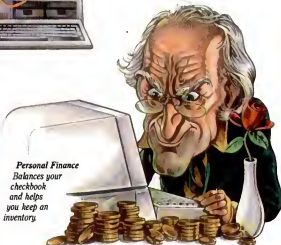
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# Zenith

## Strikes Twice



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enhances the real thing. Better yet,  
it's brought to you by a company  
that has been around for a while.



**W**hen asked to list the major micro-computer manufacturers, most people come up with almost every name but Zenith. Zenith. It's a name that brings to mind behemoth-size consoled televisions flashing black-and-white images of Lawrence Welk or Dobie Gillis. It's certainly not a name that belongs to the 1980s or to the PC market. Or does it? In this instance the public's perception may be at odds with the truth.

More Zenith computers exist out there than you may realize. According to Future Computing, only Compaq has a slightly larger share of the PC-compatible market. While the rest of the market has been shouting for consumer attention, Zenith has been quietly selling carloads of computers to the federal government, universities, and schools. According to a company spokesman, Zenith Data Systems signed the largest microcomputer contract ever with the federal government: \$30,000,000 worth of computers.

Zenith got started in the computer business when it bought out Heath. Both Zenith and Heath are well known for designing quality equipment, and Zenith computers are still available in kit form from Heath. The first computers in the Z-100 series had both 8- and 16-bit processors and could run CP/M and Z-DOS (a

variation of MS-DOS) software. The Z-100s were designed around the venerable S-100 bus, the early standard for micro-computer expansion boards.

Now, Zenith has taken the final step into the PC-compatible market by presenting a product that is so similar to the IBM PC that it is almost its twin. The new Z-150 (also known as the Z-100 PC) both looks and acts like the IBM.

The Z-150 is PC-compatible on a variety of levels. It will boot from PC-DOS 1.1 and 2.0 and will run almost any IBM PC software. I ran it through a stack of programs and demo disks, and the only problem I had was with IBM BASIC (which will run only on the IBM). At first I couldn't run any BASIC programs, since Zenith only provided a simple product demo disk: no operating system, no BASIC, nothing. I discovered that Compaq BASIC and BASICA worked just fine, however, so I was soon back in the reviewing business.

According to the manual, the operating system that is available is a custom version of MS-DOS, and another piece of Zenith literature states that the GWBASIC provided captures all of IBM's BASICA.

Zenith has tested and published a list of IBM software that will run on the Z-150. I found the list on a computer bulletin-board system that Zenith provides for its end users. I scrolled by the first 60 or so, which was enough to see that Lotus' 1-2-3 and *Flight Simulator* had passed muster. The list showed no signs of stopping soon, so I stopped; after all, it was a long-distance call. According to the list, the Z-150 will run just about anything, including *Condor*, *dBASE II* (Version 2.3), *CP/M-86* and *Concurrent CP/M-86*, *The Final Word*, *Graftalk*, *InfoStar*, and *KnowledgeMan*.

### Compatible Inside and Out

The Z-150 is compatible on the inside as well. In the floppy disk version, there are four open slots for expansion (only three in the hard disk version), and almost any IBM-compatible board will work.

The same bulletin board listed a batch of tested products, including Novation's Access 1-2-3 board modem, 3-Com's Ethernet, IRMA, Tecmar's PC-Mate, and Quadram's Quadboard. Since the Z-150 comes with many extras built in, you may not need to add anything, but it's nice to have the option. One amusing note: The Z-150 does not offer the interlaced monochrome display used by Compaq and IBM, but you can always add the IBM monochrome display/prINTER adapter board. That too is on the tested list!

Digging deeper, you soon find that the Z-150 is strikingly like the IBM PC in many respects: it runs with an 8088 processor, at a clock speed of 4.77 MHz, its floppy disks hold 360K, it has an internal speaker, it is expandable up to 640K, and it accepts an 8087 coprocessor. It even runs the IBM Advanced Diagnostics Disk and passes almost every test!

I ran the Prime Number benchmark test (see *PC*, Volume 3 Number 6, page 129 for a listing), and the Z-150 finished in 1:12, just 5 seconds slower than the PC. I also clocked the time to format a blank disk. The Zenith time of 50 seconds is just over the PC's 42 seconds.

Despite these similarities there are differences between the Z-150 and the IBM PC. Perhaps the most noticeable one is that the Z-150 is in a smaller box. At 16 inches wide, it takes up a bit less space on the desk, which is possible in large part because the Z-150 uses half-height Shugart floppy disk drives.

### New and Improved Keyboard

The keyboard is different, and, for several reasons, I preferred it to the PC's. The Return, Shift, Ctrl, and backspace keys are larger; most keys have labels in addition to the cryptic arrows found on the IBM keyboard; the left-hand Shift key takes its rightful place next to the Z key, and the backslash key has been moved down and out of the way, next to the spacebar. The tilde/underscore key has also been banished to a less accessible spot (instead of sitting right where your little fin-



### Zenith Z-150

Zenith Data Systems  
1000 Milwaukee Ave.  
Glenview, IL 60025  
(800) 842-9000; (312) 391-8744

List Price: \$2,799 for two 360K floppy disk drives, 320K RAM; \$4,499 for a floppy and a 10-megabyte hard disk.  
**Requires:** Monochrome or color video monitor.

CIRCLE 752 ON READER SERVICE CARD

ger expects to find Return). This keyboard even has an Enter key with the numeric keypad, and the CapsLock and NumLock keys have lights to indicate their status.

The Z-150 keyboard has a fairly light touch, but provides ample feedback and is easy to work with. The computer speaker produces discrete little "blip" sounds as you type, which, according to the manual,

ics display card is standard, with both RGB and composite video outputs. The card can be set to display two character sets, single- and double-dot widths, and has provisions to handle two more character sets. A parallel printer port is also included as standard.

When you look inside, you will be surprised to find that the Z-150 has no moth-

pack of software called *MFM-150*, the *Multi-Function Monitor*. This handles some thorough diagnostics that are run each time you power up.

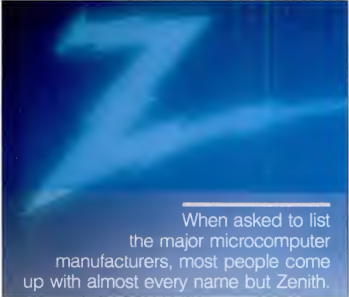
If you don't have a boot disk in the disk drive, you insert *MFM-150*, signaled by a -> prompt. Type a question mark, and you are presented with a full screen of command options.

One option is a set of Extended Diagnostics. These will exercise the disk, the memory (including the display memory), and the keyboard. You can even invoke the power-up diagnostic sequence.

*MFM-150* also contains a debugging facility that is similar to Microsoft's DEBUG. With these commands, you can display blocks of memory, fill sections of memory with a constant, examine and change memory contents, search for strings, examine and modify registers, and more. *MFM-150* also lets you specify the boot disk, the video display mode, and the scroll mode you want. Taken together, the *MFM-150* features provide a valuable collection of software that is permanently available as part of the system.

Even the MS-DOS installed on the Z-150 has a few new frills. For example, the CIPHER utility enables you to encrypt and decipher files for security reasons. CONFIGURE lets you set the I/O protocols for the different ports. FIND will search for a string in a file or files. RDCPM reads files from CPM disks, so you may be able to use the data files from your other system. There is even a utility that will load different printer drivers for the print-screen command.

The manual is an improvement over the IBM user manuals (which should come as no surprise). The manual has what is called a "20/80" approach. This means that the 20 percent you need to know to set up your system is in a separate pamphlet. Zenith hopes that users will read at least that much. Both the short manual and its larger companion are brief and to the point, well organized, and fairly well indexed. The typeset design, which uses many fonts to illustrate the commands and



When asked to list  
the major microcomputer  
manufacturers, most people come  
up with almost every name but Zenith.

can be turned off through software. On the whole, this keyboard is a great improvement. According to a Zenith dealer newsletter, it is interchangeable with the IBM keyboard (it uses the same DIN connector) and will even be sold separately if you want to add one to your favorite IBM.

As I mentioned, you may not need to add any expansion boards. To begin with, the two-drive and hard disk systems both come with 320K memory as standard. The main memory board holds the entire 320K (as opposed to the IBM PC motherboard, which only goes up to 256K).

The floppy disk controller board will handle up to four drives and includes two serial ports in the bargain. A color graph-

ic board; all the components are included on boards that fit into slots in a special back plane board. This saves space and makes swapping boards easier for quick repairs. Most of the boards also include diagnostic LEDs that show at a glance the status of the major components. Another nice design feature is the beefy power supply; it is designed to handle the hard disk—no need to add a new supply when you upgrade your floppy system.

#### Hidden Assets

Some of the best design features can't be seen with the power off. The Z-150 has a full 32K of ROM, which not only handles I/O routines, but also contains a nifty

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**CIRCLE 317 ON READER SERVICE CARD**

## Z-150

their syntax, is too cluttered for my taste. The numerous illustrations, however, make the simple setup procedures even easier. They even show you how to take the cover off to insert or change boards.

### Hindsight

There are a few aspects of this machine that I wish had been handled differently, such as the keyboard cable that must snake all the way around to the back of the machine to be plugged in.

Another annoyance is the noise level. Some of the keys, most notably the larger ones, are loud and clunky. The worst offender is the Return key, which does not share the solid feel of the rest of the keyboard. Another potential noise problem is the fan. While it is not loud enough to be objectionable, it is certainly above the "noticeable" threshold.

The power switch is another nuisance. It is a tiny rocker switch located at the back of the machine next to where the power plug is attached. You have to grope a bit to locate it when you want to turn the power on or off. It doesn't seem unreasonable to expect the power switch to be positioned on the front of the computer.

When I tried to remove the graphics display card to try out the two character sets, I found that I could not get it to slide out. The RCA plug for the composite video would not clear the chassis frame. Perhaps there's a trick to it, but it was not explained in the manual.

The most frustrating problem was probably the least serious. When I first powered up the system with the new ZVM-133 high-resolution RGB monitor, the image went scrolling madly up and off the screen, and back up again, around and around. In vain, I searched for the vertical hold adjustment. I consulted the owner's information and found that I had two Authorized Service Centers within a local call. One responded with a recorded message, but at the other Center I spoke to an enthusiastic and knowledgeable technician. Since these products are so new, he had little information on them but suggest-

ed I take the monitor in to be tested.

The monitor worked fine on his Z-100, so I later took the computer in to try with his RGB monitor. Sure enough, the image went zipping around on his monitor, too. Although I didn't have enough time to wait for a new board to be shipped in, I could see that the ZVM-133 was an exceptionally sharp monitor. It also has a feature that more displays should have; you can push a switch to turn off the red and blue guns, leaving just the green one activated. As a result, white characters appear in green, as they do on a monochrome monitor and are easier on the eyes.

In any case, I ended up evaluating the computer on the basis of what I saw on my little monochrome composite video monitor. I was impressed with the graphics that I saw, but wish I had been able to see the entire system together.

### No Fly-By-Nighters

A concern about any computer you buy is whether the company will be around next year. While Zenith is not highly visible in the PC marketplace, its share of the public-sector market has resulted in a large, established market base for its earlier designs. Given the new Z-150's high compatibility, there is every reason to believe that the government sector will gladly switch to the newer Zenith.

IBM was not the only company to hack away at its price list this summer. When first announced this year, Zenith's dual floppy-disk Z-150 had only 128K of memory and carried a list price of \$3,099. As I write this, the same computer costs only \$2,799 and has 320K—more than two-and-a-half times the memory. At this price, it is certainly competitive with the IBM products, especially when you consider all the standard features.

The Z-150 is one of the few PC-compatibles that I would consider a viable alternative to "the real thing." The strength and experience of the company, the high level of compatibility, the reasonable cost, and the many standard features make it an attractive alternative. ■

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ADDS Regent 20	Honeywell VIP7206
ADDS Regent 25	Honeywell VIP7801
ADDS Regent 40	Honeywell VIP7803
ADDS Regent 60	IBM 3101 Model 10
ADDS Viewpoint	IBM 3101 Model 20
Data General D200	Lear Siegler ADM-3A
Disapoint 3601	Lear Siegler ADM-5
DEC VT52	TeleVideo 910
DEC VT102	TeleVideo 926
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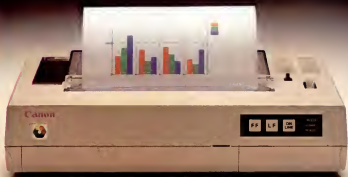
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CIRCLE 141 ON READER SERVICE CARD

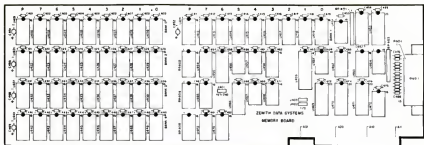
# A Do-It-Yourself Computer From Heathkit

The Heathkit HS-151-22 is really just a Zenith ZF-151-52 that hasn't been put together yet. Assembling it yourself can save you almost \$1,000 on a PC-compatible computer.

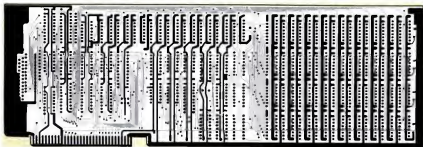
If, like me, you just can't afford an IBM PC, don't despair. Heathkit, a wholly owned subsidiary of Zenith Data Systems, now markets kit versions of Zenith's recently announced Z-150 series of PC- and XT-compatible personal computers. And, at \$1,899, the Heathkit HS-151-22 can teach you about computer construction and design while saving you \$900 off the \$2,799 list price

of the Zenith ZF-151-52.

More importantly, that price includes everything you need. The Heathkit HS-151-22 comes with an 8088 16-bit microprocessor, 128K RAM (expandable to 320K on the memory board and 640K using an additional board), both monochrome and color (composite and RGB) video outputs, three communications ports (one parallel and two serial), built-in diag-



(Shown from the component side)



(Shown from the foil side)

A diagram of the HS-151-22's memory circuit board, seen from two angles, illustrates the Heathkit assembly instructions' attention to detail.

nostics, dual 5¼-inch disk drives, support for a 10.6-megabyte Winchester hard disk, and much more. The only difference

between the Heathkit and the Zenith is that the Zenith has 320K RAM standard and you don't have to put it together.

#### Assembly

To help you get started, the kit arrives neatly packaged in one big box, weighing in at a hefty 38 pounds. The separately packaged, half-height disk drives are the same ones Heathkit uses on its HS-100 series computers using 8088/8085 16/8-bit processors.

Heathkit's excellent kit instructions are

legendary, and the HS-151-22 assembly manual appeared to be no exception, though I did have to enter a number of changes before I could begin. The HS-151-22 assembly manual provides "unpacking instructions" that caution you not to open the packets of small parts until you are instructed to do so, "assembly notes" that tell you what kind of tools you will need, and a detailed discussion of how to identify resistors. To my surprise, I also found a "Soldering Course" with special soldering instructions. This short course



#### Heathkit HS-151-22

Heath Company  
P.O. Box 1288  
Benton Harbor, MI 49022  
(616) 982-3200

List Price: \$1,899

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instructs you on how to solder multilayered circuit boards. It includes "hands-on" experience soldering five 16-pin IC sockets and resistors to a special board. The course is a great boon for novices, but I was so eager to get started building the computer that I stopped after the first practice socket.

I started unpacking the HS-151-22 looking for the prebuilt subassemblies I had encountered in previous Heathkit computer kits. I saw the power supply and the associated connector cables, the CPU-card, and the video card—all already assembled. I began to think assembly would be a snap. I remained confident even after uncovering the memory board, the disk controller board, and the backplane board—all unassembled. After all, how difficult could it be to assemble three circuit boards?

### Backplane Circuit Board

The HS-151-22 assembly manual tells you which pack contains the appropriate small parts, but I still had to cross-reference the packing slip with the instructions in order to find "pack number 2," which I needed to work on the backplane circuit board. The backplane board is the "bus" (or "mother") board into which the other cards are plugged. Assembly consisted of installing six resistors, eleven capacitors, five LED-integrated ICs, one multiconnector shell, and eight 16-pin bus connectors. This board took approximately an hour and a half to complete.

The assembly instructions were clear and concise, as the following sample illustrates:

P109: Install the female connector shell in Section 3 of the circuit board at P109. Position the notches as shown and insert the pins into the circuit-board holes. Press the connector flat against the board and solder two diagonally opposite pins to the foil. Check to make

The only difference between the Heathkit and the Zenith is that the Zenith has 320K RAM standard and you don't have to put it together.

sure the connector is flat and then solder the remaining pins to the foil.

### Memory Circuit Board

Since the backplane circuit board went so well, I moved on to the memory circuit board. After laying out the board's inventory of 78 capacitors, 11 resistor packs, 70 IC sockets, 7 plug sockets, 20 integrated circuits, 18 CMOS RAM chips, 2 logic array chips, and miscellaneous mounting screws and washers, however, I began to wonder if this one would be as easy as the last. It wasn't. I labored 4 grueling hours working on the memory board, more than twice as long as I spent on the backplane board.

Several areas caused me particular problems. First, the kit was short one 16-pin IC socket. I solved this problem by replacing it with a 16-pin socket left over from the "Soldering Course." I also had trouble finding the black nylon screws I was supposed to use to mount the parallel connector. Eventually, I learned that a quick tap with a screwdriver would reveal the difference between the nylon screws and the nearly identical steel screws. Additionally, cutting the foil on the circuit board required painstaking care. The final step of mounting all of the chips was a bit

tedious, but I kept reminding myself that I had only one more board to assemble.

### Disk Controller Circuit Board

The disk controller circuit board looked to be easier to assemble than the memory circuit board was because its IC sockets were of varying sizes. Indeed, aside from the fact that it took 5 hours to put together, it was no trouble at all.

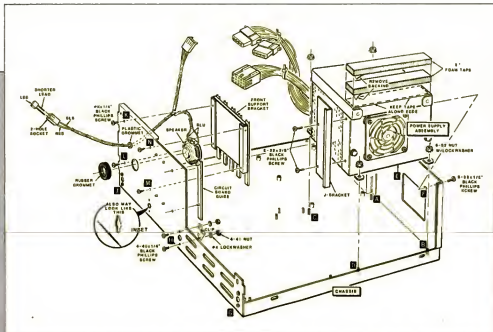
The time was necessary because of the large number of parts. I had to install 17 resistors, 32 ferrite-core capacitors, 42 ceramic capacitors, 5 resistor packs, 2 controls, 11 capacitors, 1 LED, 33 IC sockets, 2 connector plugs, 8 pin plugs, 1 jumper connector, 2 crystal oscillators, 1 RF choke, and 1 delay module. In addition, as on the memory circuit board, the integrated circuits go into each of the IC sockets, and some of the 40-pin ICs were a bit recalcitrant.

### The Chassis

With the completion of the boards, all of the hard work was done. All that remained was attaching the large pre-assembled parts to the chassis. The power supply bolted directly onto the main chassis with no hassle, while the rest of the chassis work consisted of placing the "stick-on" feet on the bottom, placement of the front bezel, and mounting the disk drives on their brackets and then bolting them to the chassis. The power cables plugged right into the drives. I finished this up in a couple of hours.

### The Keyboard

The HS-151-22's detachable keyboard is light and well constructed, and it has a better layout than the IBM keyboard has. The Return key is larger and is shaped like a backwards L. The Backslash key has been moved to the left of the space bar next to the Alt key. (IBM places it next to the left shift key.) The Heathkit's shift



This exploded view of the assembly of the HS-151-22's main chassis, including the power supply and its associated cables, shows how carefully the instructions inform you of what goes where.

keys are larger than the equivalent IBM keys, and Heath has placed them in their traditional location.

The keyboard practically assembled itself in just 30 minutes. One integrated circuit had to be placed into its socket and the coiled cable connected. The only difficult part of the keyboard assembly was the adjustable feet. The instructions lacked clarity in this area, which caused some minor delays. Still, I had assembled the entire computer in just 13 hours.

#### Diagnostic Tests

Heath provides a complete set of diagnostic tests to insure that your kit will work properly once it's finished. The HS-151-

22 diagnostic program begins with 20 continuity checks before it applies power to the backplane board. LEDs determine the testing sequence. The manual provides an "In Case of Difficulty" matrix in case you have trouble or something doesn't work. This is an extremely important part of the assembly manual. The following sample instruction shows how the program works:

Press the POWER switch to ON. The power supply fan should operate and four of the five LEDs on the backplane circuit board should light. The PSG (Power Supply Good) LED may or may not be lit at this time.

The diagnostics continue by checking

the pre-assembled CPU board. This board contains the 8088 microprocessor and also has an empty socket ready to receive an 8087 math coprocessor. The CPU card contains six LEDs for "power-up" diagnostics checking RAM, ROM, Initialization, Ready, the Disk Controller, and the CPU. Each component must function properly to release the LED and allow the diagnostics to proceed.

The CPU card checked out and there were no problems with the backplane board. The memory card also checked out all right. I was getting excited because I was only a few steps away from the world of IBM compatibility. Then it happened. The disk controller board showed a prob-

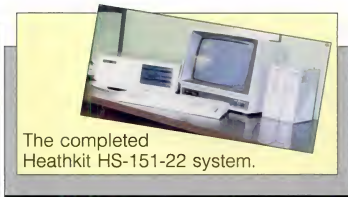
lem and would work only intermittently. I removed the board and searched in vain for loose solder connections. After ensuring that all of the chips were well seated in their sockets I tried the diagnostic process again. To my delight, it now worked perfectly.

The next step involved setting the bias and frequency controls on the disk controller board. For some reason, I could not get the two settings to match. After several hours spent pulling out the board and resoldering sockets, the two settings finally matched. However, I discovered another problem when I tried to boot the operating system. The disk-drive motor turned on and stayed on whenever a disk was inserted. This annoyed me because the disk motor should shut off when the disk is not in use. Then the system started to act up in other ways—the DIR command returned filenames in upper and lower case, and when I logged on to the A: drive, the system returned a "++ + DISK ERROR: Bad Disk Controller! ++ +".

### Customer Service

The next day I called my local Heathkit store for help, and the salesman who sold me the kit said, "Just bring in the unit and we will take a look at it." I figured I was in for weeks of delays, but it took him less than 5 minutes to find the problem. He pulled out the disk controller board and removed one of the 40-pin chips. One of the IC sockets was bad and the pins on the IC could not make good contact. He then took a small screwdriver and lifted the plastic housing from the 40-pin IC socket and, with a small pick, pulled the socket pins out. The unit has worked flawlessly ever since.

While the salesman was fixing the IC socket, I casually mentioned that the drive motors would not turn off. Another customer in the store overheard and informed me that "all you have to do is turn the



The completed Heathkit HS-151-22 system.

jumper from "MM" to "MS." So I pulled the jumper plug and re-installed it and sure enough, the disk motor turned off as soon as the head select light went out. What service—a technician/salesman fixed the disk controller in 5 minutes and a fellow Heathkit user solved the drive motor problem while I was waiting! But that's the way the Heath community is. I've been a member of my local HUG for a couple of years now and whenever a member has a problem, another member always lends a helping hand.

### Documentation

The HF-151-22 comes with MS-DOS 2.0 and 1.25. The manual, reprinted by Zenith Data Systems, measures a full 2 inches thick! However, it is the most complete, well-written manual I have ever used, with a clarity and quality of presentation that more than made up for its size. This manual consists of 5 sections and 19 chapters covering everything from an introduction to the operating system to detailed technical material for the optional Winchester hard disk.

The *Operations Manual* is also clearly written and well organized. Its five chapters and glossary provide information on hardware, operations, general service, and software summaries, as well as a "User's

Guide" to lead you through the setup process. I wanted to use the dot matrix printer I already owned (a Centronics 737), and I easily found the instructions for configuring the serial port.

The disk-based diagnostics included with the HF-151-22 are excellent. The manual contains a chapter for each diagnostic test, including The Diagnostic Monitor and Test, RAM Diagnostics, Input/Output Port Diagnostics, Display Diagnostics, Floppy Disk Diagnostics, Winchester Disk Diagnostics, and appendices covering Help Screens and H/Z-100 PC Repair Procedures. The diagnostics software itself is the most complete set of diagnostic tools for the Heath PC that I've ever seen. It checks "all possible errors in systems hardware." If an error is detected, the program stops and presents an error message indicating the most likely cause of the failure—right down to the individual components!

You have three ways to perform diagnostics on the system. First, the self-checking diagnostics take 4.5 seconds to check the hardware for major problems (LED-based diagnostics on the CPU card that will indicate a malfunction by major component, such as the RAM, the disk controller board, and so on). Second, the menu-driven, ROM-based diagnostics

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Adding a hard disk to an IBM PC can be very much like stuffing a V-8 engine in the back seat of your VW bug. There is room to put it there, and you will have one fast beetle - but you create a whole new set of problems. Like excessive power drain. IBM didn't plan for a hard disk in your PC, so they put in a meager 63.5 watt power supply (XT's have 130 watt power supplies). Most of the hard disks out there need so much power to run them that they can barely add any expansion boards and still have enough power to operate with. And all that power results in excess internal heat - reducing the life of electronic components.

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**I**n the white-collar world, the tangible evidence of work is a piece of paper bearing information—an invoice, a monthly sales report, a quarterly balance sheet, a list of checks. The continuing search for better and easier means to produce these ends has led to many brilliant inventions. Indeed, microcomputers and their associated software are simply the latest in a long line of tools designed to perform the practical, day-to-day functions of counting, remembering, and communicating—only the paper has been eliminated.

The release of *Corporate MBA* is another step in the evolution of better information processing tools. It's a step

---

toward truly integrated systems that can perform a variety of different tasks. *Corporate MBA* is a fully integrated package that combines spreadsheet, graphics, word processing, telecommunications, and database management functions. Overcoming some of the limitations of earlier releases of the product, *Corporate MBA* may be the system you've long been waiting for.

Often referred to as the "grandfather of integrated software," Context Management Systems' first product, *Context MBA*, has the distinction of having been the first integrated software package for microcomputers. It was first shipped way back in 1982—a few months before Lotus' 1-2-3 hit the market and became a blockbuster. *Context MBA*'s combination of spreadsheet, database management, business graphics, word processing, and forms generation functions made it a powerful information broker.

There was a problem though. It was written in UCSD Pascal, which prevented it from running under MS-DOS. Pascal also prevented it from running very fast. These factors contributed to *Context MBA*'s lack of popularity in the microcomputer software market. Large corporations, more closely tied to their own mainframe systems than to MS-DOS, did purchase *MBA*. Most individuals, though, couldn't get over the fact that the DOS commands they'd finally mastered didn't work with *MBA*. They never made it past

this hurdle to the well-designed, powerful tool on the other side.

*Corporate MBA* successfully eliminates those obstacles. Designed snugly under MS-DOS, it not only takes advantage of subdirectory paths, but also adds a powerful facility for transferring files to and from other popular software packages such as *WordStar*, *Multiplan*, *VisiCalc*, and *dBASE II*. A utility program allows

There is no need to return to a main menu because all functions are performed from the worksheet.

users of the old Pascal version of *MBA* to convert their files to run under the new version. The use of MS-DOS has also considerably accelerated the speed of the program. Calculations, database functions, and graphing are now all performed with the customary speed of today's commercial software. And, finally, *Corporate MBA* adds IBM 3270 terminal emulation and a powerful macro command facility.

### Design

At first, *Corporate MBA*'s screens look just like any spreadsheet: rows and columns of blank cells. As with any other spreadsheet, each cell may hold a numerical value, a formula to calculate a value, or a text label. Most spreadsheets, however, limit the length of each cell's contents to less than 256 characters. Each *Corporate MBA* cell can expand to hold up to 8,000 characters of text. That's enough

space for a four-page letter. Individual cells can be expanded to full screen size to reveal their full contents, or closed to fit in the space allocated as just one cell on the worksheet.

Besides holding text or numerical data, *MBA*'s cells may also contain a form, a memo, a graph, a command macro, or a communications formula. For example, in one cell you could store the sequence of entries required to dial up the mainframe at your central office and download the latest account summaries. Another cell might hold the entries required to dial up Dow Jones News Retrieval and view the latest quotes for your portfolio. In either case, you would be able to execute the whole sequence by pressing one key.

You can easily switch from Telecommunications mode to Word Processing mode to Spreadsheet mode by selecting from a primary command tree. There is no need to return to a main menu because all functions are performed from the worksheet. You never need to change disks. Furthermore, *MBA* can display up to four different windows at once. For example, you can view a table of values in one window, examine a pie chart based on the table in a second window, and look at a bar chart in a third window, while typing the text of the report in a fourth window (see Figure 1). This is true software integration.

Originally marketed as "decision support software," *MBA* easily handles "what-if" questions. You can set up a model that will prompt you for entry of the projected rate of growth of sales, for example, then automatically recalculate projected net income for the next 2 years and display and print a bar chart showing the results. With the macro command facility, all this can be accomplished with a single keystroke.

Of course, *Corporate MBA*'s power entails a certain level of complexity. In particular, the entries required to build a graph, to telecommunicate, or to print may seem cumbersome to those not familiar with simple programming languages.



### Corporate MBA

Context Management Systems  
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(213) 378-8277

List Price: \$695

Requires: 384K RAM, two double-sided disk drives or hard disk, IBM color graphics adapter. An IRMA board is necessary for 3270 terminal emulation.

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In practice, though, executives can build a complex model and save the most common sequences of commands in macro cells. A data-entry operator can then update the model regularly without having to learn the more complex commands.

New users need not approach this package hesitantly, however. The documentation, disk tutorials, and demos are all backed up with a toll-free support line. An interactive disk tutorial makes it possible to learn the package without ever opening a manual. On-line help is available at the touch of the question mark (?) key.

## Spreadsheet

Spreadsheets are still the backbone of most integrated software packages, and *MBA's* version has all the features and functions you'd expect from a top-notch entry, including color graphics and data-management capabilities. As is common on many spreadsheets, commands are entered with a slash (/) preceding them. The program takes full advantage of the IBM PC keyboard's PgUp, PgDn, Home, and End keys. You can get to the end of the workspace simply by typing >LR. This translates as "go to the lowest right corner."

The formatting commands include all the usual formats, with the added benefit that each cell can be many lines high. This makes entering long labels extremely easy, as the second line of a heading need not appear in the next row; it merely becomes the second line of the cell.

One of the best features of the *MBA* spreadsheet is that you can refer to cells by a "marker" name. A cell containing a memo could be given the marker "MEMO" and then be referred to as such. For most people, this is easier to remember than a cell address. You can view the names of all the markers on the spreadsheet with a simple slash command. This feature is important since the *MBA* worksheet contains 95,000 cells, and it's very easy for cell addresses to get lost in the breezy corridors of the human mind. The markers make it easier to remember which

## MBA's spreadsheet has the features and functions of a top-notch entry.



cell you're looking for and then to quickly get there.

Similarly, an entire range of cells could be marked and given a "box" name. Neither boxes nor markers can be used in formulas, but they can be used in all commands, such as GO TO (>), /COPY, or /BLANK.

All the usual logical and financial functions, such as net present value and internal rate of return, are present and work well. The /MOVE command acts on ranges of cells, in addition to rows and columns. The /COPY command can be used to copy other files into the spread-

sheet. One thing we missed was the ability to see the contents of a cell and know at a glance whether you're looking at a formula or a value. With *MBA*, you have to edit the cell if you wish to determine its exact contents.

## Graphics

*Corporate MBA* offers a variety of business graphics that can easily be generated from any spreadsheet. Like Lotus' 1-2-3 and many other popular graphing packages, a graphics adapter is required for monochrome screens. Charts are generated by entering a simple formula designating the type of graph, the data to be graphed, titles, and legends. A graph description consists of several graph functions linked by plus (+) signs. For example, the formula

```
@PLOT(BARS) + @DATA(C, L12
... P23) + @TTL(T,
"SALES")
```

entered in a cell, would create a stacked bar chart (BARS) using the data arranged by column in the specified range (C,L12

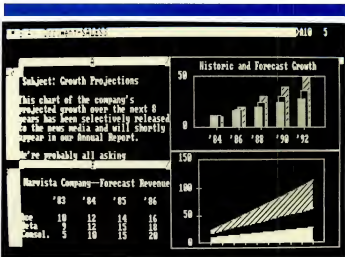


Figure 1: This screen demonstrates *Corporate MBA's* ability to display up to four dynamic windows at once, here including text, a chart, and two different kinds of graphs.

# Enhancements

## SOFTWARE

<b>Aptec</b> (for color Prism Printers)	
Rainbow Writer Color Text Formatter	\$119
Rainbow Writer Screen Grabber	69
<b>Ashlan Tale</b>	
dBase II	279
dBase III	375
Upgrade (dBase II to dBase III)	139
Framework	375
Friday!	169
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<b>Best Programs</b>	
Personal Finance Programs	65
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PC/Fixed Asset System	297
PC/Tax Cut	149
<b>Bible Research</b>	
THE WORD (KJV Bible - 7 disks)	145
<b>Bruce &amp; James</b>	
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<b>Digital Research</b>	
CP/M-86	39
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<b>Financier</b>	
Financier II	115
Financier Tax Series	97
<b>Funk Software</b>	
Sideways	45
<b>Lifetree</b>	
Volkswriter	115
Volkswriter International	135
Volkswriter Deluxe (with TextMerge)	165
<b>Lotus Development</b>	
1-2-3 (version 1A)	call
Symphony	call
<b>Micropro</b>	
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CAI training disk and tutorial disk	
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Norton Utilities	55
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through October 31, 1984

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PFS/Graph	89
PFS/Write	89
PFS/Report	79

### Software Systems

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### Sordim

Supercalc 3 199

### Virtual Combinatics

Micro Cookbook 29

### Warner Software

The Desk Organizer w/1 yr. free updates 197.

## TRAINING

### ATI

- How to use Lotus 1-2-3 (volume 1 & 2) 49
- How to use Wordstar (volume 1 & 2) 49
- How to use dBase II (volume 1 & 2) 49
- How to use EasyWriter II 49
- How to use Multiphan 49
- How to use Your IBM-PC 32
- How to use MultiMate (volume 1 & 2) 49
- How to use Microsoft Word 49
- How to use PC DOS 32
- How to use TK1 Solver 49

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- Professor DOS 47
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- Professor Pixel 47
- Typing Instructor 39

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- Master Type 39

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| FriendlyWare/PC Introductory Set | 35 |
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- MegaPak 128k (not upgradeable) call
- MegaPak 256k call
- IO Plus II with clock calendar and serial port (parallel, game, or second serial port optional) 129
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- Connectal connector bracket (PC only) 19
| **AST-521** | |
| **AST-3/80** | |
| MonographPlus with clock calendar, serial & parallel ports 429 | |
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| IBM Mono Screen Enhancement | 17 |
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# for advancements.

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The Source (subscription & manual) 49

# PC CONNECTION®

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... P23) and add the title (TTL) "Sales" at the top of the chart. Nine different types of charts are available, from common pie and line charts to area graphs and perspective bar graphs. You can combine two types of charts by adding a second @PLOT command to the formula.

Titles can be typed in, as in the above example, or can be called as a cell reference. Thus you could type in SALES or merely specify the cell where SALES is located. You can choose whether the title should appear at the top, bottom, left, or right of the graph. The formula, once typed in, appears as the letters GRPH in the spreadsheet. To view the graph, the cursor is simply placed over the cell and a function key expands the window, with the graph displayed. A graph may be one of the four windows that can be viewed simultaneously on the spreadsheet, database, or word processor.

### The Database

Traditionally, databases have not been considered the strongest part of integrated software packages. *MBA* changes that

thinking. In addition to the usual database functions found in spreadsheets, such as data extraction and arrangement in ascending or descending order, *MBA* offers a terrific forms generator.

With a single command, a blank cell becomes a screen onto which a form can be created for either viewing existing data or for creating a new database (see Figure 2). You can use a form to print data from the database, or for mailing labels or a standardized letter.

### Word Processing

The *MBA* word processing module is no *WordStar*, but it's fine for helping executives make more efficient use of their time and free themselves for the processes of decision making. It handles documents up to four pages long with no trouble. And, it's easy enough to learn that people not accustomed to word processing can begin using it immediately. To enter text, one simply moves to an empty cell. With the entry of one slash command, the cell expands to fill the entire screen. The prompt line changes to list the available

commands, which include JUMP TO, FIND, REPLACE, and other common text-editing commands.

One of the few unfulfilled items on our spreadsheet "wish list" is a global find and replace facility for spreadsheets. *MBA* comes close—you can put a spreadsheet in a text cell and perform a find and replace. You cannot, however, return the spreadsheet to the worksheet for further calculations, because only values, not formulas, are transferred to text cells.

### Telecommunications

*MBA* offers asynchronous communications as well as IBM 3270 communications. The Communications mode works similarly to the Graphics mode. Protocols are defined by a formula consisting of communications functions linked by plus (+) signs. For example

```
@DIAL(555-5555)
+@ASYN(1,300,7,E,1)
```

translates into the number to be dialed and the port number, baud rate, data bits, parity, and number of stop bits.

When you enter any of the communications functions in a cell, that cell will display the characters COM. Log-on procedures can be entered each time you dial up from the keyboard or can be included in the communications formula cell. Functions such as @RECEIVE and @WAIT can be combined with others to enable you to log-on, download data, and then hang up—all automatically.

### Macros

*MBA*'s powerful macro command facility is one of its most outstanding features. Sequences of frequently used keystrokes and commands can be saved into a cell as a macro and executed with a single stroke of the F7 key. Macros can be recorded in two ways: either by pressing the macro-record function key (F8) and then entering the keystrokes desired, or by typing the sequence of keystrokes into a cell with the word processing commands. The first method allows you to record key-

Figure 2: Corporate *MBA*'s forms generator allows a single command to draw "boxes" that turn a blank cell into a form for viewing existing data or creating a new database.

stroke sequences as you perform them; you can see what you are doing as the macro is being recorded. When you turn off the Record mode, you are prompted to

The documentation, disk tutorials, and demos are all backed up with a toll-free support line.

place the macro in a cell or a temporary buffer. The buffer lets you record part of a macro, enter data, and then recall the macro to record the rest of the sequence.

*MBA* allows you to create macros that will execute, display a message prompting you for data entry, then resume again after the appropriate data have been entered. This feature is useful for setting up a worksheet that allows data entry by another person. The ability to display prompt messages makes this possible even for relatively inexperienced operators.

Like all cells in the *MBA* workspace, a cell containing a macro can be given a marker name. Macro cells containing the marker label *STARTUP*, will be automatically executed whenever you load the document in the workspace.

## Summary

*Corporate MBA* is not intended to meet the needs of every person in the office. It is not a heavy-duty word processor and, compared to the newer mouse and icon systems, it's not easy to learn. It has been designed more for the manager than for the secretary. It is, however, a powerful combination of those functions most critical to number-crunching and reporting. Complete integration and powerful macro commands make this package worth considering for every executive who works with detailed information. ■



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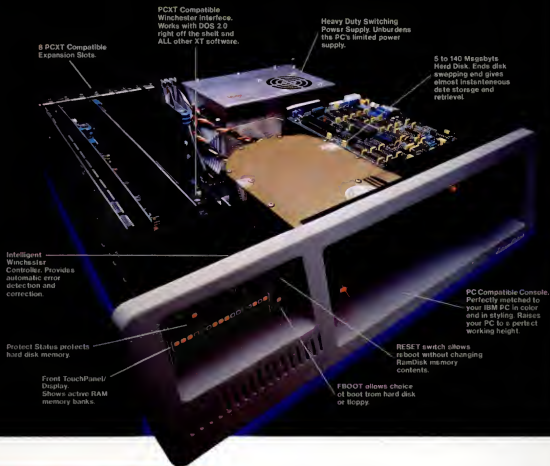
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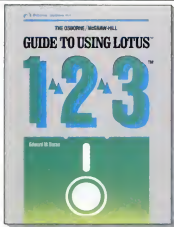
# A 1-2-3 Tutorial:

## A Guide to Making Macros More Flexible

Macros can reduce complex 1-2-3 tasks to a few keystrokes. /X commands, which permit macros to distinguish among varying conditions, make them even more powerful.

**I**n this issue, PC Magazine offers the second excerpt from Edward M. Baras' Osborne/McGraw-Hill Guide to Using Lotus 1-2-3, published by Osborne/McGraw-Hill, copyright 1984, Berkeley, California. All rights reserved. The previous installment provided an initial view of 1-2-3 as a database manager and demonstrated how to automate an application using macros. This excerpt will show, among other things, how to create customized menus of macros.

The \B macro (discussed in the first excerpt from the *Guide to Using Lotus 1-2-3*; see "A 1-2-3 Tutorial: Organizing Information with Data Sort," PC, Volume 3 Number 18) is adequate for sorting the second-quarter sales of the fictional Play-Rite Merriment Company, but what about sorting the other quarters? One possibility is to create a macro for each of the other three quarters, but this would take quite a bit of effort. A better method is to make \B more flexible by enabling it to handle any quarter. In the revised procedure, the user will have to tell 1-2-3 which quarter's sales should be the sort key. Once



1-2-3 has this information, it can be instructed to set the Primary key to the associated column. The sequence of operations is outlined in the sidebar "Steps for Creating a Flexible Macro" accompanying this article.

### CONTROLLING MACRO EXECUTION

Before you create a flexible macro, you must know how to endow a macro with the intelligence needed to distinguish between quarters and how to instruct a macro to issue sequences of keystrokes conditionally, depending on which quarter is the current quarter.

The macros developed up to this point have been exact duplicates of keystrokes that could have been typed manually by

the user. These macros contained no internal intelligence or logic, just plain 1-2-3 keystrokes. However, there exists a class of commands unique to the macro environment, commands that cannot be used outside of a macro. These are the /X commands. The /X commands control the sequence of execution of a macro. With the /X commands, the macro becomes far more

## LOTUS 1-2-3

than a mere typing alternative; it becomes an intelligent "automatic pilot."

### The /XI Command

The /XI command directs 1-2-3 to perform certain tasks only if a certain condition has been fulfilled. The format of the command is

`/XI conditional formula ~ ... keystrokes...`

The /XI command has the following meaning: If the result of the conditional formula is true, then read any keystrokes that follow the ~ (tilde) in this cell; otherwise, skip to the next macro cell below this and continue execution. The I in /XI stands for *if*, and the ~ represents *then*, so that the anglicized version of the command is, "IF the condition is satisfied, THEN execute the keystrokes that follow."

Whatever comes between the I of /XI and the following ~ is the conditional formula. For example, consider the macro label

`/XI QTRX=1~/DSPQTR1~`

The condition is `QTRX=1`. If this condition is true (that is, if the cell named QTRX contains a 1), then the macro will execute the remaining keystrokes in the cell, which represent the following command:

`/Data Sort Primary-Key QTR1 <Enter>`

In other words, if the current quarter is the first quarter, then the macro sets the Primary key to QTR1 and then continues with the next macro label. Otherwise, 1-2-3 skips to the next macro label without executing the `/DSPQTR1~` keystrokes.

Observe that the tilde following the conditional formula stands for *then*, but the tilde at the end of the Data command represents an Enter keystroke. Whatever follows that first tilde, whether a single command or several commands, will be performed only if `QTRX=1`. Otherwise, the flow of command proceeds to the next cell down.

### The /XG Command

Another useful command is /XG. The G stands for "go to," instructing 1-2-3 to skip to some other macro cell to obtain the

next macro command. For example, `/XG J9~` would direct 1-2-3 to stop whatever it is doing, go to cell J9 (a macro cell), and follow whatever instructions are contained there. The destination of the /XG command can be an actual cell reference or a cell name. The tilde following the coordinate is essential. If the destination coordinate is not followed by a tilde, the macro will not work.

Together, /XI and /XG permit us to translate Steps 2 through 6 of the sidebar into the language of macros. Assume that cell QTRX already contains the value of the current quarter. Begin entering macro VB with the following steps:

1. Name the QTRX cell by moving to J1 and typing `/Range Name Create QTRX <Enter> <Enter>`.
2. Move to VB (cell K5).

The first task for the macro is to examine the contents of QTRX to see whether the file should be sorted by first-quarter sales. If so, we want it to issue the appropriate Sort command. The macro label to do this would be

`/XI (QTRX=1)~/DSPQTR1~D~SNAME~A~G`

Here we have enclosed the condition in parentheses, which contributes to clarity. To the right of the first ~ are the keystrokes to be executed for the first quarter, which translate as follows:

`/Data Sort Primary-Key QTR1 <Enter>  
Descending <Enter>  
Secondary-Key NAME <Enter> Ascending  
<Enter> Go`

In this case, we must violate our convention of keeping the labels short. There is a good reason for this. All keystrokes that are subject to the /XI condition *must* be stored in the same label as the /XI command itself.

Begin by entering the label in cell K5. (We will be replacing the old contents of K5 with a new entry.)

3. Type `'/XI(QTRX=1)~/DSPQTR1~D~SNAME~A~G`.

Do not press Enter yet. If you did, press the F2 (Edit) key to continue entry. So far, we have entered only part of Step 2 of our planned procedure, which was to sort the file based on QTR1. If we were to end the label here and if QTRX were 1, then 1-2-3 would execute the keystrokes of the rest of the cell and then proceed to the next cell of the macro.

Instead of proceeding to the next label, however, we want 1-2-3 to stop processing the macro. One way of stopping macro execution is to instruct 1-2-3 to go to a blank cell. When 1-2-3 goes to the blank cell, it stops processing the macro because only nonblank labels are valid macro cells.

To which cell should we tell 1-2-3 to go? We will use a cell at the end of the macro we are currently developing, but we have not yet finished the macro, so we do not know where the



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CIRCLE 753 ON READER SERVICE CARD

## Steps for Creating a Flexible Macro

Here are step-by-step instructions for revising a macro to make it more flexible.

The macro \B sorts the worksheet according to second-quarter sales of the fictional Play-Rite Merrimack Company. If you wish to perform the same sort of operation for first-, third-, or fourth-quarter sales, it is not necessary to write three additional macros. Instead, \B can be revised to make it more flexible. The following steps show how to revise \B and similar macros.

**Step 1:** Store the value of the current quarter (1, 2, 3, or 4) in a cell that is separate from the macro. In this case, we will name the cell QTRX.

**Step 2:** If QTRX contains a 1, then the first-quarter sales should be sorted. The macro will assign the cell named QTR1 to the Primary key, assign NAME to the Secondary key, execute the sort, and then skip to Step 6. If QTRX does not contain a 1, the macro will proceed to Step 3.

**Step 3:** If QTRX contains a 2, the macro will assign QTR2 to the Primary key and NAME to the Secondary key, then execute the sort and skip to Step 6. If QTRX does not contain a 2, the macro proceeds to Step 4.

**Step 4:** If QTRX contains a 3, the macro will assign QTR3 to the Primary key and NAME to the Secondary key, then execute the sort and skip to Step 6. If QTRX does not contain a 3, the macro then proceeds forward to Step 5.

**Step 5:** If QTRX contains a 4, the macro will assign QTR4 to the Primary key and NAME to the Secondary key. It then executes the final sort and proceeds forward to Step 6.

**Step 6:** Stop.

end is—we know only that we want to skip to that location. Wherever that cell may be, let us plan now to give it the name CONTINUE1. We will create CONTINUE1 with the Range Name Create command later—as soon as we can ascertain the address of CONTINUE1. For now, we need to tell the macro that, if QTRX=1 is true, it should sort the worksheet and skip to CONTINUE1. We use the /XG command:

4. Type /XGCONTINUE1~ and press Enter.

The first \B cell, cell K5, should now contain the label

```
/XI (QTRX=1)~/DSPQTR1~D~SNAME~A~G/
XGCONTINUE1~
```

The next cell will represent Step 3 of the planned procedure. It is almost exactly like Step 2, except that QTRX=1 is replaced by QTRX=2, and QTR1 is replaced by QTR2. Instead of typing the entire label again into the next cell, K6, we will just copy K5 and edit its contents.

5. With the pointer on cell K5, type /Copy <Enter>.
6. Move down once, to cell K6.
7. Press the Enter key.
8. Move down to cell K6.

Now enter Edit mode:

9. Press the F2 (Edit) key.
10. Change the characters QTRX=1 to QTRX=2, and change QTR1 to QTR2.
11. Press Enter.

The next cell, K7, will perform Step 4 of the plan.

12. Repeat the procedure of instructions 5 through 11, but substitute QTRX=3 for QTRX=2 and QTR3 for QTR2. Do the same for the next cell, K8, replacing QTRX=3 with QTRX=4 and QTR3 with QTR4. Now Steps 2 through 5 of the plan are done.

The next macro cell, K9, represents Step 6. It is the blank cell that ends the macro, the elusive CONTINUE1 that we have been waiting to define. Before continuing, we will name cell K9 CONTINUE1.

13. With the pointer at cell K9, type /Range Name Create CONTINUE1 <Enter> <Enter>.

When the macro is done, 1-2-3 will resume the Ready mode. The updated version of macro \B is shown below.

```

      K           L           M           N           O
5  /XI (QTRX=1)~/DSPQTR1~D~SNAME~A~G/XGCONTINUE1~
6  /XI (QTRX=2)~/DSPQTR2~D~SNAME~A~G/XGCONTINUE1~
7  /XI (QTRX=3)~/DSPQTR3~D~SNAME~A~G/XGCONTINUE1~
8  /XI (QTRX=4)~/DSPQTR4~D~SNAME~A~G/XGCONTINUE1~

```

To put \B to the test, we will load QTRX with the value for the second quarter.

14. Go to QTRX (cell J1) and set it equal to 2.

Then invoke the macro.

15. Say your favorite prayer.

16. Hold down the Alt key while typing B. (continued)

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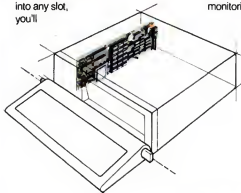
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1						(\$ IN THOUSANDS)		
2			PLAY-RITE MERRIMENT COMPANY					
3			SALES RANKING SYSTEM					
4								YTD
5	REGION	NAME	QTR1	QTR2	QTR3	QTR4	YTD	RANK
6								
7	WESTERN	SHAW, G. D.	90	60			150	4
8	NORTHERN	WILLIAMS, T.	89	67			156	3
9	SOUTHERN	ALJEE, E.	87	84			171	1
10	EASTERN	O'NEILL, E.	87	75			162	2
11	WESTERN	IBSEN, H.	62	79			141	5
12	CENTRAL	MILLER, A.	61	79			140	6

Figure 1: Results of Macro \B showing sort by QTR1 sales.

Your results should coincide with those of the second-quarter sort that we did (in the previous excerpt).

#### Identifying Macro Errors (Not for Version 1.0)

With a macro such as \B, it is very easy to make logical or typographical errors. If you heard a beep or if your results are wrong, then you probably have made a typographical error. Under normal conditions, 1-2-3 executes a macro as fast as it can, often faster than the user can follow. It is difficult to detect exactly which command the macro is executing when an error occurs. How can you find the error?

Version 1A of 1-2-3 introduced a very useful facility for testing macros: the Single-Step mode of macro execution. Whether or not you were successful with macro \B, it is important to know how to use this facility.

By holding down the Alt key while pressing the F1 (Help) key, you will cause 1-2-3 to enter Single-Step mode.

1. Hold down the Alt key while simultaneously pressing the F1 (Help) key.

The word STEP is displayed in the lower right-hand portion of the screen; from here on, the macro will execute only one step at a time. A step is defined as a single keystroke or a single /X command. Before each step, 1-2-3 waits until you press any key; then it will execute the step. It is possible to speed up the process by holding down a key—in effect, repeating the keystroke. Release the key when you reach the steps that you would like to follow closely.

Begin the single-step execution of \B:

2. Hold down the Alt key while typing B.

Notice that an SST (Single-Step) indicator appears at the top right, a signal to press any key. Press a key several times and watch the control panel. As 1-2-3 executes each keystroke of /X command, the control panel displays what is being typed or

performed by 1-2-3. Hold down the key, and the macro will execute quickly. Because QTRX=2 is true, the macro ends after it does the processing for the second quarter. You will not see the keystrokes related to the third and fourth quarters; these keystrokes were skipped over, thanks to the /X command.

To disable Single-Step mode,

3. Press the Alt key while pressing the F1 (Help) key.

The STEP indicator will disappear from the lower right-hand portion of the screen.

Single-Step mode is very useful, especially in long or complicated macros. Another technique, more preventive in nature, is *verbal coaxing*. If you talk to your macro, encourage it, and praise it, your macro may respond positively. This technique is rumored to work in all versions of 1-2-3.

#### Including Prompts with /XN (Not for Version 1.0)

The quarterly sort can be automated even more. As it stands, the user must remember to put the value of the quarter into QTRX; otherwise, the macro will malfunction.

There is another /X command called /XN, which prompts the user for a number, retrieves the user's responses, and stores the response in a designated cell. The format of the command is as follows:

/XNmessage~location~

Here *message* is the prompt that will be displayed to the user in the control panel, and *location* is the cell address or name where the number is stored. If the \B macro began with the label

/XNI BESECH THEE, ENTER THE QUARTER: ~QTRX~

then as soon as Alt-B was pressed, the user would be asked to enter the quarter. If the user then pressed 2 followed by Enter,





## LOTUS' 1-2-3

the number 2 would be stored in QTRX (cell J1). Cordial, courteous prompts can make the worksheet much more pleasant to use.

The \B macro currently begins in cell K5. When inserting a command into a macro, you can manipulate the macro's cells just like any other cells in the worksheet. However, after any changes to the positions of the cells, it is essential that the range name for the macro (in this case, \B) be attached to the first cell. For future purposes, it is necessary to have this macro begin in cell K5. Therefore, to insert the /XN command at the beginning of \B, the rest of the macro must be moved down one cell as follows:

1. Press the F5 (GoTo) key; then type \B <Enter> to move to the cell named \B.
  2. Type /Move to invoke the Move command.
  3. Press the End key and then press the down arrow key twice to highlight the entire macro including the blank cell CONTINUE1.
  4. Press the Enter key.
- The pointer returns to its original position, and 1-2-3 requests the destination of the move.
5. Move down one cell to K6.
  6. Press the Enter key.

The macro is shifted down, and the pointer returns to the blank cell above the macro. Enter the /XN command, beginning with a label prefix:

7. Type /XN1 BESEECH THEE, ENTER THE QUARTER:~QTRX~.
8. Press the Enter key.

Next check on the location of \B using the F5 (GoTo) key. Type F5 \B <Enter>. You will find that \B is attached to its old assignment, which is now the second cell of the macro, so it must be reassigned.

9. Type /Range Name Create \B <Enter>.
- Now 1-2-3 will recommend K6, the current assignment of the \B name.

10. Move the pointer up once to cell K5.
  11. Press the Enter key.
- We are back in business.

12. Test the macro by holding down the Alt key while typing B.

In the control panel, 1-2-3 will beseech you to tell it which quarter you wish to use for the sort.

13. Respond with a 1 to sort according to first-quarter sales.
- Remember to press Enter after the 1. Your results should match the portion of the worksheet shown in Figure 1.

### ADDING MORE MACROS

Thus far, we have built macros to sort and rank by year-to-date sales and to sort by quarterly sales. Next, we will create

three more macros to sort by name, sort by region, and print the worksheet.

#### Sort by Name: Macro \C

When the entire sales force of 200 is eventually incorporated into the database, it would be easier to locate particular individuals in the file if it were sorted alphabetically. All that is required is to point the Primary key to the Name field and Go. The data range is already in 1-2-3's memory. The command would look like this:

```
Data Sort Primary-Key NAME <Enter>
Ascending <Enter> Go
```

If we put this into a macro called \C, the procedure will be that much easier in the future.

1. Move to cell L5.
  2. Type /Range Name Create \C <Enter> <Enter> to name the macro.
  3. Enter the label /DSPNAME~A~G and press Enter.
- Hold down the Alt key and press C to execute the macro. To rank the file on YTD sales and then alphabetize it, invoke macro \A and then invoke macro \C.

Because the label in the previous column (beginning in cell K5) was so long, the \C label interrupts it. Let us move back to column K and widen the column so that we can see the entire macro.

4. Move to cell K5 and type /Worksheet Column-Width Set 48 <Enter>.

Before we continue, let us also widen the columns for the other macros in advance.

5. Move to cell L5 and type /Worksheet Column-Width Set 14 <Enter>.
6. Move to cell M5 and type /Worksheet Column-Width Set 24 <Enter>.
7. Move to cell N5 and type /Worksheet Column-Width Set 50 <Enter>.

#### Sort by Region: Macro \D

Another useful arrangement would be one with records alphabetized by region and, within each region, by name. This is accomplished by the following commands:

```
Data Sort Primary-Key REGION <Enter>
Ascending <Enter>
Secondary-Key NAME <Enter> Ascending
<Enter> Go
```

Hence, to enter macro \D,

1. Move to cell M5.
2. Type /Range Name Create \D <Enter> <Enter> to name the macro.
3. Type /DSPREGION~A~SNAME~A~G.

## 4. Press Enter.

Invoke the \D macro. Observe that the two records of the Western region, Ibsen and Shaw, are arranged alphabetically within their region.

## **Print the File: Macro \E**

Now that the macros have been developed to sort the file in various ways, a macro should be written to output the file to a printer.

When developing a macro, the initial step is to figure out how the task might be accomplished interactively, without a macro. Implement the steps to report the file, record the steps as they are executed, and then translate them into a macro.

The report should start from the top-left corner of the worksheet, which is where you should transfer the pointer:

1. Press the Home key.

Enter the Print menu:

2. Type /Print.
3. Select the Printer option.

Clear any previous print ranges:

4. Select Clear Range.

To enter a print range,

5. Select the Range option.
6. Type a period to anchor the range.

Now 1-2-3 requests the lower right-hand corner of the range to be printed. Normally, it would be sufficient to use the down-arrow and right-arrow keys to move the pointer to the bottom right. However, we are going through this exercise for the sake of writing a macro, and a macro executes automatically—it is not aware of the bottom right of the worksheet. It must be instructed exactly how many times to move right and how many times to move down, which is not readily available information. By using the End key, we can cleverly circumvent the problem.

If the pointer is on a blank cell, then pressing the End key followed by an arrow key transplants the pointer to the next nonblank cell in the direction of the arrow. If the pointer is on a nonblank cell, then pressing the End key and an arrow key moves the pointer to the last contiguous nonblank cell before a blank cell.

With the proper combination of keys, the pointer can be shifted down to the Region field name (cell A5), over to the Rank field name (H5), and down to the bottom right-hand corner of the worksheet.

7. Press the End key, followed by the down arrow key. The range A1..A5 will be highlighted, but this is not yet the entire range desired.

8. Press the End key once again, followed by the right arrow key.

Now the range A1..H5 is highlighted.

9. Press End and then the down arrow key again.

The entire range, A1..H12, is now designated in the control panel, so

10. Press the Enter key to accept this range.

If you were to add the column widths of the print range, you would find that our report will be 79 characters wide. Because 1-2-3's defaults are a left margin at 5 and a right margin at 76 (75 in Version 1.0), the report will be too wide to print. This can be fixed by changing the left and right margins to 0 and 79, respectively.

11. Type Options Margins Left 0 and press Enter.

12. Type Margins Right 79 and press Enter.

13. Select Quit to return to the Print menu.

Make sure the paper in the printer is aligned and that the printer is on, and then

14. Type G to select the Go option.

The report should print out. To skip to the next page and exit the print menu,

15. Select Page and Quit.

Here is a recapitulation of the commands used to print the report:

```
<Home> /Print Printer Clear Range
Range <End><Down><End>
<Right><End><Down><Enter>
Options Margins Left 0 <Enter>
Margins Right 79 <Enter>
Quit Go Page Quit
```

The special keys that must be translated to the macro are Home, End, down arrow, right arrow, and Enter. Translating these keystrokes, we create the macro to print the report:

```
{HOME}/PPCRR.{END}{DOWN}{END}
{RIGHT}{END}{DOWN}~
OML0~MR79~Q
GPQ
```

We will split this macro into two labels:

```
16. In cell N5, enter the label
{HOME}/PPCRR.{END}{DOWN}
{END}{RIGHT}{END}{DOWN}~
```

```
17. In cell N6, enter the label
```

```
OML0~MR79~QGPQ
```

18. Press the Enter key.

Name the macro \E:

19. Move to cell N5, the beginning of the macro, and type the following:

```
/Range Name Create \E <Enter> <Enter>.
```

Now align the printer paper and invoke macro \E.

## **CREATING A MENU FOR EASY-TO-USE MACROS**

The worksheet now has a collection of five macros. To

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Every level of activity is fully prompted and the documentation, while excellent, seems almost unnecessary because of the help provided by the thorough on-line prompting.

...over Datazoom feature ...ing through records, ...raw data and the

...the familiar ...or text types. ...one screen can be ...up to a linked file, an ...among fields in several ...function (sum, min, max, ...subset of fields in link

...quick, even ...fully linked files. ...base's B-tree inst

The ...in the version ...on the input side. Its ...are mostly on the output

For example, power-base's report-writing facility allows only one sort level. While this can be overcome with manual intervention (making selects manually, one level and sorting automatically on the second), it is a considerable limitation in a product designed for serious data manipulation.

The report-writing utility is basically not much more than a listing device. It can output to printer or diskfile, and it provides good support for headers and page control. It also allows subtotals and grand totals on selected numeric fields. However, its page-formatting capability is strictly

limited to list-type structures.

Ironically, the report writer can not produce documents (such as invoices) from multilevel databases, despite the fact that the documentation's emphasis is based on an invoice.

### Success

The ...power-base ...to the release of ...is scheduled for July.

...is said to include multilevel ...-feature report writer (and thus ...age-formatting capability), a label utility, support for fixed-length records, global replace, and global recalculation. The new version will also support import and export of files in DIF, SYLK, SDF, WKS, BASIC, and ...

The ...version of power-base, ...the promise of a real blockbust ...the manufacturer delivers on its promises for Version 1.1, I could happily recommend this database management system to anyone with a requirement for a simple-to-use, ad hoc data ...

Version 1.1 would be worth every penny of its \$395 retail price. Without the Version 1.1 improvements, however, power-base is nothing but a fancy but grossly overpriced index card system.

PC is watching for Version 1.1 and will report on it as soon as possible. Meanwhile, readers might want to wait for Version 1.1, too. —Richard Aarons

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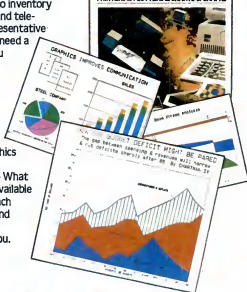
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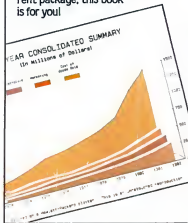
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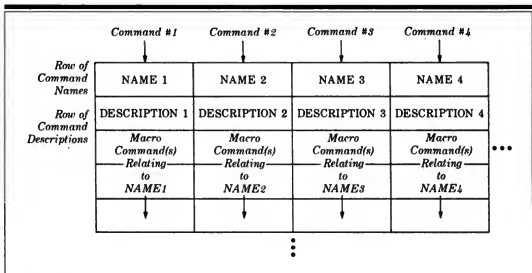


Figure 2: Format of a user-defined menu range.

invoke them, the user must know how to execute a macro and must also remember which macro is which. The names that the macros have been given are not particularly descriptive. Wouldn't it be nice to turn on the machine, and—without having to be aware of macros, databases, or range names—see the screen display in English a choice of procedures that are available for use with the Sales Ranking System?

The /XM command lets you create your own 1-2-3 menus. You can choose your own command names and assign these names to macros that you have created. Each menu can contain up to eight commands. Like regular 1-2-3 menus, the user-defined menu displays the command names on the second line of the control panel. The menu pointer highlights one of these commands, and it can be moved to another command by using the pointer movement keys. On the third line of the control panel, a descriptive phrase (designed by the user) explains what will occur if the command highlighted by the menu pointer is selected.

#### Setting Up the Menu Range

Figure 2 portrays the specific way in which a menu must be constructed. A user-defined menu consists of up to eight commands, which are incorporated into a menu range. The menu range includes one column for each of the menu commands and at least three rows for each. The first column of the menu range relates to the first command of the menu. Its uppermost cell contains the command name, which should begin with an

uppercase letter. The second cell in the column is a label containing an explanation of the command. The third cell, and any cells below it, store a macro that is executed when the associated command is chosen.

Now it is clear why all of the macros of this worksheet are located side by side in consecutive columns and why they all start in row 5. We plan to integrate the macros into a menu. We can use row 3 for command names and row 4 for command descriptions, thus completing the menu range. With the menu range constructed, we need only inform 1-2-3 that a menu exists and tell 1-2-3 where it is located in the worksheet.

For review, see Figure 3 for the macros that have been defined for the ranking system.

In choosing command names for a menu, make sure that no two commands begin with the same letter. Then there will be no ambiguity when a command is chosen by typing the first letter of its name. Here are names for the five commands that will invoke macros \A through \E:

MACRO	COMMAND NAME
\A	YTD
\B	QTR
\C	NAME
\D	REGION
\E	PRINT

With this information, we can enter the menu.

(continued)

MACRO	COLUMN	DESCRIPTION
\A	J	Rank salespeople by year-to-date sales
\B	K	Rank salespeople by quarter sales
\C	L	Sort database alphabetically by name
\D	M	Sort database alphabetically by region and name
\E	N	Send file to printer

Figure 3: Macros defined for the ranking system.

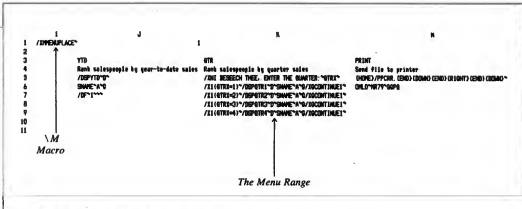


Figure 4: The menu macro and the menu range (midsection not shown).

1. Use the command names just given to complete the row of command names (row 3) for the menu range. For example, the label YTD should be entered into cell J3, QTR into cell K3, and so on.

2. Next press the CapsLock key to allow for lowercase typing.

3. Use the table of macro descriptions to enter descriptive labels into row 4 of the worksheet. For example, "Rank salespeople by year-to-date sales" is the label to be entered into J4, "Rank salespeople by quarter sales" into K4, and so on.

The completed menu range should resemble Figure 4 (except that the midsection of the menu range has been omitted from the figure because of space limitations).

4. Press the CapsLock key to restore uppercase typing.

#### The Menu Macro: \M

Figure 4 also shows a new macro in cell I11. This macro contains another /X command, /XM. The /XM command

informs 1-2-3 of a menu's existence and location. The structure of the command is /XMlocation~, where location is the top-left corner of the menu range—in this case, cell J3. All 1-2-3 needs is the location of the top-left cell. It can deduce where the rest of the menu is, because it knows that the macros that form the menu must be next to each other.

Instead of referring to cell J3 in the /XM command, let us give J3 the name of MENUPLACE, just in case the menu gets moved away from cell J3.

1. Move to cell J3.

2. Type /Range Name Create MENUPLACE <Enter><Enter>.

The /XM command will be /XMMENUPLACE~. Like other /X commands, /XM may be used only within a macro. Therefore, we must create a new macro whose only entry is /XMMENUPLACE~. For example, a macro \M could be defined, containing the /XM command. Invoking the \M macro will activate the user-defined menu.



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3. Move to cell I1 and enter `'XMMENUPLACE~`; then press the Enter key.

4. Type `/Range Name Create \M <Enter><Enter>`. The label was cut off by the entry in cell J1, so widen column I by doing this:

5. With the pointer on cell I1, type `Worksheet Column-Width Set I3 <Enter>`.

Now hold down the Alt key while typing the letter M to invoke the macro. The moment the letter M is pressed, the following user-defined menu will appear on the second line of the control panel:

YTD QTR NAME REGION PRINT

and the menu pointer highlights the first option, YTD. The mode indicator on the top right shows CMD MENU, because 1-2-3 is executing a menu under the command of a macro. The bottom line of the control panel displays the description for the YTD command, which is stored in cell J4.

When we move the pointer to the right, another command is highlighted, and its associated description appears below it. Pressing the Enter key will execute the macro pertaining to whatever command is highlighted by the menu pointer, and typing the first letter of a menu option has the same effect. Pressing the Home key transfers the pointer to the first command in the menu, whereas the End key shifts it to the last command.

Select the QTR command. In an instant, the prompt for the quarter appears. Respond by entering 1 and pressing the Enter key. The file is now in descending order of first-quarter sales. The menu disappears, the macro is completed, and Ready mode is resumed. To invoke the menu again, just invoke the \M macro.

If you invoke the menu but then decide you do not want to use the macro, how do you abort the menu? There are three ways to do this. One method is to press the Esc key; another is to hold the Ctrl key down while pressing Scroll Lock; a third method is to mimic other 1-2-3 menus by including an Exit command within the menu.

## Adding a Command to a User-Defined Menu

We can add a command to the menu range simply by entering it into the next column of the menu.

1. Move to cell O3.
2. Enter the label EXIT, which serves as the command name.
3. Move down once to cell O4.
4. Enter the description Exit from the menu.

How can you make the Exit command work? There is no way of instructing the macro to press the Ctrl Scroll Lock key because these two special keys have no macro translations. However, there is another /X command, /XQ (the Q stands for

quit), that has precisely the same function as this keystroke sequence.

5. Move down once to cell O5.
6. Enter `'/XQ`.
7. Press the Enter key.

Now see if it works. Invoke the macro \M and choose the Exit option.

## A Homemade User Interface

Let us step back for a moment and consider the design of our menu. Whenever a user selects one of the options we have provided, 1-2-3 will execute the appropriate macro and then relinquish control to Ready mode. It is likely, though, that the user would rather be returned to the user-defined menu than to Ready mode. For example, the user might want to sort the worksheet and then print it—two separate commands of our menu.

Can we instruct each command of the menu (except for Exit) to return to the menu when it is done? We certainly can, using the /XG command. In the last cell of each of macros \A, \B, \C, \D, and \E, we will enter the label `'/XGM~`. This will send 1-2-3 to the menu macro, which invokes the menu anew.

1. In each of cells J8, K10, L6, M6, and N7, enter the label `'/XGM~`.

Invoke the menu by holding down the Alt key while typing M, and then execute a command. You will be returned to the menu when the selected macro finishes executing. We have succeeded in creating a fairly closed environment, one that a non-experienced person could learn quickly. In fancy terms, this is called a *user interface*.

## WHY USE MACROS AND MENUS?

In this worksheet, we have automated five of the principal tasks of Play-Rite Merriment's ranking system by incorporating them into macros. Moreover, we made the macros themselves easier to use by integrating them into a menu. Now to execute any of the principal tasks, a user need only hold down the Alt key while typing M. From that point on, the system almost runs itself.

Training a nontechnical person to utilize this menu system will be much simpler, and much faster, than trying to teach someone to use the more complex operations of the Data Sort, Data Fill, and Print commands. The user needs to know only how to use the menu pointer and how to respond to prompts. This can be taught in a matter of minutes.

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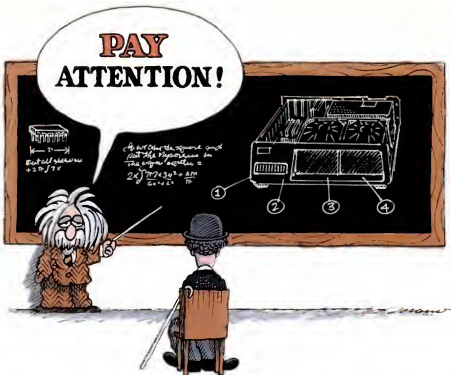
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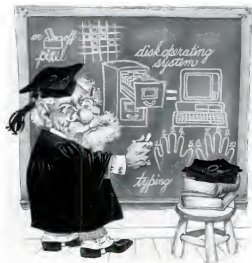


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With *Professor DOS*, you learn how to

make efficient use of the Disk Operating System, which is as vital to a disk-based computer as batteries are to a flashlight. The disk will not teach you anything that cannot be learned from the IBM manual or a good book on DOS, but it will probably do the job faster and make the process more fun.

A third program, *Typing Instructor*, offers training of a more general nature; in other words, although you need an IBM PC or compatible computer to use the program, the typing lessons can be applied to any standard keyboard, even a typewriter. *Typing Instructor* is designed to correct bad typing habits and shortcomings.

All three programs are well written, thoughtfully structured, and—as far as I have been able to determine—error-free. This does not mean there isn't room for improvement, but short of physically exposing the disks to such harmful elements as dogs and minestrone soup, I tried in vain to damage them. Each program and its manual are packaged in a protective hard-vinyl folder. Except for the *Professor Pixel* manual, which has three graphics exercises, the booklets mainly list hardware and software requirements and give step-by-step instructions for creating bootable disks (using either one or two drives) or preparing the programs to

## FOUR-STAR DISKS

run from a fixed disk. Since all the program disks are copy protected (although not very well), the instructions do not wholly transfer the programs to the hard

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## FOUR-STAR DISKS

my interest long enough to make a touch typist of me. I admit I still have a long way and many keystrokes to go toward that goal, but this may be the program that accomplishes the impossible.

*TT* takes you by the fingers through a series of individually accessible lessons that range from teaching key locations and proper placement of the hands to summarizing the basic concepts of word processing. It even illustrates the proper seating

I have tried similar programs on the Apple II, but none has held my interest long enough to make a touch typist of me.

posture and placement of screen and keyboard and has a practical diversion called "Lobster Sea Adventure," in which you type a given text while evading some very hungry crustaceans. A lot of action is crammed onto one disk.

After booting up, you are given the choice of following the program's natural path or jumping ahead to the main menu. If you choose to continue, you have to wade through "Using the Typing Instructor," a section of a dozen slow-forming screens that extol the program's virtues and describe its special commands. However, since the short manual duplicates the same information, you can skip ahead to "Typing Basics for Beginners," the first lesson. It teaches proper posture, hand positioning, keystroke fingering, and familiarity with the PC keyboard. If you are running the program on a PCjr—whose keyboard has a different layout—don't worry; when following the accompanying booklet's simple instructions for transferring DOS to the master disk, you are given an opportunity to set three defaults: color or monochrome display, regular or faster

reading speed, standard IBM PC or PCjr keyboard. You are not told how to change the screen mode (color or monochrome) once DOS has been added to the disk, but

the configuration menu is easily summoned by running the DOS SETUP file. If you find the text moving too fast or too slow once you are in the program, you

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MICROCAP II lets you be even more productive. As an advanced version, it employs sparse matrix techniques for faster simulation speed and larger net-



Typical MICROCAP Transient Analysis\*

works. In addition, you get even more advanced device models, worst case capabilities, temperature stepping, Fourier analysis, and macro capability.

## MICROLOGIC: Your Digital Solution

MICROLOGIC provides you with a similar interactive drawing and analysis environment for digital work. Using standard PC hardware, you can create logic diagrams of up to 9 pages with each containing up to 200 gates. The system automatically creates the netlist required for a timing simulation and will handle networks of up to 1800 gates. It provides you with libraries for 36 user-defined basic gate types, 36 data channels of 256 bits each, 10 user-defined clock waveforms, and up to 50 macros in each network. MICROLOGIC produces high-resolution timing diagrams showing selected waveforms and associated delays, glitches, and spikes—just like the real thing.



Typical MICROLOGIC Diagram\*

## Reviewers Love These Solutions

Regarding MICROCAP... "A highly recommended analog design program" (PC Tech Journal 3/84). "A valuable tool for circuit designers" (Personal Software Magazine 11/83).

Regarding MICROLOGIC... "An efficient design system that does what it is supposed to do at a reasonable price" (Byte 4/84).

MICROCAP and MICROLOGIC are available for the Apple II (64k), IBM PC (128k), and HP-150 computers and priced at \$475 and \$450 respectively. Demo versions are available for \$75.

MICROCAP II is available for the Macintosh, IBM PC (256k), and HP-150 systems and is priced at \$495. Demo versions are available for \$100.

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CIRCLE 497 ON READER SERVICE CARD



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# Inside Outside

Just a few years ago, computers needed big air-conditioned rooms to operate in, bafeuls of money to buy, and a team of wizards to keep them running. The constant march of technological progress has given more and more powerful machines which cost less and less. Desktop computers more powerful than the early mainframe computers are the result of the evolution. The Qubie' modems represent the latest extension of this progress. Because up until now, a 212A compatible modem cost at least \$500. Through the use of four low-cost, state of the art microprocessors, we can now offer two versions of our full featured 212A modem at prices the competition sells 300 baud modems for.

## In The Beginning

In September of 1983 we introduced the first 212A modem card for the IBM PC available for under \$300. The PC212A/1200 is a complete communications package including PC-TALK III software, modular phone cable, card edge guide, and instruction manual. The modem is an auto-dial, auto-answer type, which uses all the Hayes software commands so it can be used with any of the popular software packages including Crosstalk™ and Smartcom™. We picked the best software package we could find based on it's ease of use and features. PC-TALK III. Our modem includes features the old industry standard missed out on. Like being able to fit in one slot in a Portable PC or PC/XT.

Or an optional connector to use the modem's serial port when not using the modem. Of course the topper is the \$299 price, hundreds less than the competition.

## Now Available Outside

Our standalone modem, the 212E/1200 can be used with any computer or terminal with a RS-232C serial port. You can use any Hayes compatible communications software on anything from an Apple to a Zenith. Many owners of IBM PC's are using it because they lack available expansion slots, or have more than one computer they want to use their modem with.

It's attractive gold anodized case houses seven status lights (who says low prices means a shortage of features). It fits comfortably under a standard telephone. It is also a 212A compatible auto-dial, auto-answer modem which supports all Hayes software commands. Even the switch settings are the same, so any software giving recommended switch settings for a Hayes modem can be used, without knowing what the switches do. There is a volume control knob for easy adjustment of the speaker's output. Included in the package is modular phone cable, a cable to hook it to your computer or terminal, and instruction manual. Choose the communications package right for your needs, and you're ready to go!

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CIRCLE 227 ON READER SERVICE CARD

## FOUR-STAR DISKS

can, at any time, make temporary changes in speed or turn the sound off by hitting the Ctrl-R key combination.

The second lesson, "Learning the Key Locations," graphically demonstrates the proper placement of hands and fingers, which fingers should strike which keys, and so forth. Throughout this lesson and the course, you are prompted to hit certain keys, and while the program cannot tell if you used the correct finger, it refuses to continue unless you hit the right key or key sequence. If you make a mistake or wait more than 5 seconds before responding, an annoying "helpful hint" appears. For example, the screen shows the keyboard with four of the keys highlighted and the following instructions: "Press one of the highlighted keys with your right first finger." Okay, that's easy enough, but if you hesitate to respond, the following appears

ACCURACY		SPEED	
PERCENT ACCURACY:	97.67	WORDS PER MINUTE:	26
NUMBER OF WORDS WITH ERRORS:	1	NET WORDS PER MINUTE:	24
WORDS TYPED WITHOUT ERRORS:	5	BEST NET WPM ON A LINE:	32
NOTE: NET WORDS PER MINUTE (NET WPM) = words typed per minute less two words per minute for each word typed incorrectly.			
WORDS FOR PRACTICE			
assist avoidance			
The words for practice are the first 10 words on which you erred. Now you can work on these words to improve your accuracy skills even more.			
DO YOU WANT TO TAKE A SHORT PRACTICE ON THE WORDS SHOWN ABOVE (Y/N)?			
HELPFUL HINT : Y IS A GOOD CHOICE			

Figure 1: Typing Instructor's evaluation screen.

immediately below: "Helpful hint: use the first finger of your right hand." If you become impatient with these hints, press Ctrl-N to quickly move ahead to the next screen.

Novice typists will probably spend a lot

of time learning key locations and correct finger placements, but if you have had typing lessons before, you may want to move to the next section, a series of practices called "Building Accuracy and Speed." I believe advanced students as

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well as beginners will benefit from these sessions: You may select the nature of your practice text from a menu of offerings such as Prefixes, Numbers and Symbols, Vowel Patterns, Consonant Patterns, BASIC Language Statements, and sentences with 500 of the most-used words.

Before starting each lesson, you are offered a screen full of Hot Tips that may be bypassed during subsequent sessions if you've memorized them or no longer need the advice. And following each typing test, the program gives helpful feedback, such as singling out the words you have difficulty typing and offering you a chance to practice typing them (see Figure 1).

The next step, "Typing Skills Evaluation," offers extended practice using material from three menu categories: Business and Official, Technical, and General Nature. These exercises cover more than one screen, and the evaluation following each session points out mistyped characters rather than words, differentiating between upper and lower case. These typing tests are excellent, and the program's evaluations feature should spur even the best typists on to faster, more accurate output. Beating your last "score" can easily become a game with obvious benefits.

As games go, "Lobster Sea Adventure" is a fairly good one. You select typing material from easiest, more difficult, and very challenging categories, pick a lobster speed of between 15 and 90 words per minute, and then start the race. It's you against the clawing sea monsters; only good typing can save you. When a lobster catches up with you, the game is over, ending with a few sad beeps and a scoreboard with your total, including possible bonuses, and your five previous scores.

The last section is a 24-screen summary of the principles of word processing. It is concise and well-organized, but since there are a large variety of word processing programs—each with its own quirks—this section is understandably quite general. Still, it makes a nice finale for this excellent program.

#### Beyond Necessity

You don't have to have a hacker's knowledge of DOS to use your computer, but you should have *some* familiarity with

it even if you only use DOS for common tasks such as word processing and record keeping. Of course, the DOS manual will teach you everything you need to know

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

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## FOUR-STAR DISKS

about DOS—that is, if you force yourself to read it. *Professor DOS* hands-on approach is more interesting than dry reading and may make you want to learn more

than is absolutely necessary. The program—a faster, improved version of a previous release—is divided into four main sections: "PC Concepts," "DOS

Editing Keys," "DOS Commands," and "DOS Applications."

Assuming you have no prior knowledge, *Professor DOS* first explains—with text and simple, but effective graphics—the "PC Concepts": the basic DOS functions and the reasons for learning how to handle a few of them. With a drawing of a two-drive system and printer on the screen, the program prompts you through a series of fairly mundane, but indispensable, routines, such as changing default drives, formatting diskettes, and loading BASIC. Each step is clearly illustrated and explained, and although it does not actually address the drives to carry out the various

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Professor DOS' hands-on approach is more interesting than dry reading and may make you want to learn more than is absolutely necessary.

commands, the screen response is exactly what it would be if the commands were real. Like *Typing Instructor*, *Professor DOS* can be configured to display the standard IBM PC keyboard or PCjr's, but these authors have also included a third option that displays only the function and control keys. Once again, unless this is your first encounter with a computer, the constant prompts for answers to simple questions quickly become tiresome. Luckily, you can always press Ctrl-N to turn the page. This section can be valuable whether you're a novice or have some previous experience with operating systems other than PC- or MS-DOS. Of course, if you already have a rudimentary knowledge of PC-DOS or the way computers structure files, you may want to skip this section altogether by pressing Ctrl-E, which calls

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## FOUR-STAR DISKS

up the main menu to the screen.

Since I have experience with other operating systems, I found the introductory lessons a bit tedious, especially when

the program started at square one and drew the inevitable analogy between a computer and a file cabinet. However, even these basic lessons taught me a few new tricks.

Remember, what proved tiresome and redundant to me will appear otherwise to the less initiated—*Professor DOS* is aimed at the beginner.

The "DOS Editing Keys" section explains the use of the PC's various function and control keys. MS-DOS has many built-in editing features that are especially handy when entering program listings. Therefore, this part of *Professor DOS* is a thorough guide to the functions of these keys that requires plenty of useful input from you. If you complete this lesson, you should pass the final quiz at the end of the program with flying colors.

### Learning DOS Commands

If you don't know common DOS commands, you might as well go back to a typewriter or adding machine. Of course, there are some commands you probably will never use, but *Professor DOS* isn't taking any chances, so its "DOS Commands" section, which mainly covers file manipulation, is quite comprehensive. To successfully complete this lesson, you must recall what you learned from "PC Concepts" and have also memorized

Short of having a private tutor, I can't think of a better way to learn the intricacies of DOS.

some of the previous lesson's editing commands. The program again asks for your participation by posing questions, and—true to form—all but furnishes the answers as "helpful hints." This time, however, provisions are made for you to practice these commands, at your own pace, at the end of the lesson—an excellent feature.

The "DOS Applications" section explains how to use DOS for such specific tasks as creating system disks, making backup copies, revealing the contents of

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## FOUR-STAR DISKS

an unlabeled disk, running various types of files, using wildcards, and making and using batch files. This well-conceived lesson requires enough input from you to keep you awake.

Since DOS comes with a line-oriented text editor, EDLIN, *Professor DOS* offers a lesson and practice exercises on its use. EDLIN is not the greatest line editor I've seen, but since it is supplied on the DOS disk, you may want to use it until something better comes along. The "Using EDLIN" section explores and explains every facet of this editor and even contains a special section devoted to the EDLIN enhancements introduced when DOS 1.1 was upgraded to 2.0.

Speaking of DOS 2.0, the *Professor DOS* lessons I have discussed so far all apply to features found in both the earlier and later versions of the system. The menu also offers an update section covering additional commands and features introduced with DOS 2.0, including some that pertain only to the IBM PC-XT or comparable hard disk systems, such as tree structures, new format options, filter commands, and pipes. This information is helpful if you have just upgraded your version of DOS.

### Three Points of Reference

The program's final offerings are three useful and easy-to-access menu-driven reference files: a "Dictionary" of computer terms; "Reference Guides," a handy rundown on all the DOS and EDLIN commands covered in this program; and a "Technical Journal" consisting of 15 screens that explain—with illustrations—the inner workings of DOS and the structure of disks. You can dump the entire contents of the dictionary to a printer; I can't understand why you can't do so with the other reference files.

Short of having a private tutor, I can't think of a better way to learn the intricacies of DOS; you'll quickly recoup the time you spend going through *Professor DOS* when you later breeze through the system's functions using its built-in shortcuts.

However, unless you have a photographic memory, you should hold onto your manual because you may need to refer to it from time to time.

### Coloring Is Fun

Although not as essential as the DOS tutorial, *Professor Pixel* is certainly more colorful and more fun. If you plan to do

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## FOUR-STAR DISKS

any BASIC programming, even in its simplest form, this package can be very useful. It will not teach you how to write a BASIC program, but it explains how to

use BASIC commands to create impressive graphic embellishments (including animation) with sound. And even if you never actually write a program, you are

bound to have fun exploring this tutorial, and I think you will find it difficult to resist the temptation to at least create *something* with the help of the knowledge you gained, even if it's just a simple stand-alone bar graph. Creating graphics and sound is not new to me, yet I spent a good part of a sunny day experimenting with these newly learned commands.

The easiest way to experiment after taking this course is to enter a simple BASIC program from a magazine or add some bells and whistles to one of the simpler public domain programs. I spruced up a few menus by adding color and sound, but since I am only new to MS-BASIC (or PC-BASIC, if you will) and not to BASIC per se, I decided to test *Professor Pixel's* effectiveness on a friend whose sole previous computer experience consisted of formatting disks and using *WordStar* for 6 months. She spent a couple of days with *Professor Pixel* and presented me with a screen on which a buffalo jumped over a frightened moon and then disintegrated in a shower of falling pixels. I was suitably impressed.

*Professor Pixel* delivers—better than any written manual could—on its promise

Creating graphics and sound is not new to me, yet I spent a good part of a sunny day experimenting with these newly learned commands.

to take the mystery out of graphics, sound, and animation. It begins by explaining the necessary tools—including a cursory description of graphics hardware and their functions—and then proceeds to teach BASIC graphics and sound control in a systematic and entertaining fashion.



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## FOUR-STAR DISKS

Under the heading "Graphics Concepts," *Professor Pixel* teaches painting, animation, drawing, and the creation of predefined shapes; and, as accompaniments to those visuals, the "Sound Concepts" section delves into the creation of musical notes, sound effects, and combined music and animation. Throughout the course, pertinent BASIC statements and format conventions are explained in a simple, yet not condescending manner, and you are given ample opportunity to interact and demonstrate what you have learned. Unlike the two other programs reviewed here, *Professor Pixel* poses no pesky questions and refrains from giving the dreaded helpful hints. In short, this is an exemplary program.

One final note about this program. Whereas *Professor DOS* and *Typing Instructor* contain a SETUP file for mono-

chrome or color display configuration and can be used without a graphics card, *Professor Pixel* should, for best results, be

## Professor Pixel delivers on its promise to take the mystery out of graphics, sound, and animation.

used with a color monitor, and it requires a graphics card.

Individual Software is not the first company to release machine-specific disk tutorials, but I think *Professor Pixel*, *Professor DOS*, and *Typing Instructor* are,

with the few reservations noted, as good as any we are likely to see. Taking good advantage of the PC's color and monochrome graphics capabilities, they endeavor—successfully, for the most part—to maintain the student's interest and make the learning process enjoyable. The value of *Typing Instructor* to any two-fingered typist is obvious, and it brings hope even to someone who, like me, has developed sufficient speed the unprofessional way to make touch typing seem a bit of a luxury. And while *Professor Pixel* and *Professor DOS* clearly cannot teach the well-versed IBM PC user anything new, they can prove quite useful to anyone whose previous computer experience has been with another system. The newcomer to computers should, at the very least, find *Professor Pixel* interesting, and *Professor DOS* essential. ■

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# A Perfect Flight

Microsoft Flight Simulator, the best and the most realistic of its breed, lets you experience the excitement of soaring through the sky, without leaving the controls of your PC.

**W**hat a month it was! First, I got the chance to "fly" two of the world's most complex, full-visual aircraft simulators as part of an assignment for another magazine, and then *PC* asked me to "fly" the newest version of the world's most affordable visual aircraft simulator, the *Microsoft Flight Simulator, Version 2.0 (MFS)*. The timing was fortunate, as it allowed me to compare the popular program for the PC with the real-life models used by the airlines.

Much to my surprise, in comparison with the real-life simulators I flew—one representing a Gulfstream III and the other a Learjet 36—*MFS*, representing a Cessna 182, proved to be quite a competitor.

The two principal differences between the real-life simulators and Microsoft's are that real-life simulators actually move and are very expensive, costing

about \$3 million each. *MFS* does not move, but then on the other hand, it costs only \$49.95.

And while real-life simulators impart an unrivaled and unmistakable aura of realism, it's my belief that *MFS* is realistic enough to serve as an excellent training aid for primary flight students who don't have unlimited access to the real-life alternative.

Microsoft should be commended for

its upgrade of the already justifiably famous *Flight Simulator*. The new version includes enhanced graphics, and most importantly, it brings previously neglected PCjr owners and RGB monitor users in on the fun.

## Test Flight

Does *MFS* really "fly" like an airplane? You bet it does. In fact, I put the *MFS* Cessna 182 through the same series



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## PC ARCADE

of maneuvers *Business and Commercial Aviation Magazine* uses to evaluate real airplanes. I did stalls, steep-banked turns, low-speed flight, and a whole series of stability checks. I could have sworn my PC had wings.

Microsoft has exaggerated some flight aspects, but in general the flight simulation is excellent.

Microsoft has really earned its wings. It has mastered the simple aerodynamic relationships of control surface movement to attitude and also some of the more complex elements of flight.

While you don't have to understand all the terms associated with these complex elements of flying to have fun and learn with *MFS*, it's good to know that the simulator you are flying is, indeed, behaving like a real airplane.

All response rates are realistic, as is control harmony and the correspondence of the visual world to control movement and instrument indication.

Microsoft has exaggerated some flight aspects, such as the corresponding "softening" of control response as airspeed drops and the tendency of the nose to drift away from trim attitude (long-term stability), but in general the flight simulation is excellent.

### Navigation

*MFS* navigation simulation is as real as you can get. For routine point-to-point navigation over the United States, Canada, and Mexico, pilots use a system of ground-based navigation aids called Very-high-frequency Omnidirectional Ranges (VORs).

Student pilots must learn to orient themselves to these ranges by observing

the cockpit navigation display. They must also learn how to use the VOR signals for tracking to or from a station and to use the signals from more than one station to pinpoint their location. Some VORs transmit signals interpreted by airborne distance-measuring equipment (DME) to give distance to or from the station. All of these features are beautifully implemented by *MFS*.

Using the onboard VOR and DME equipment in a dynamic environment often causes difficulties for new pilots. The *MFS* navigation simulation is good enough, in my opinion, to be used for serious navigational instruction.

Needle-movement rates, station-closure angles, and crosswind effects are realistically presented. Of course, the navigation simulation is in real time.

As I played with *MFS*, all I could think of was the hundreds of hours I've spent drawing two-dimensional navigation sketches for new flight students. The sketches were always inadequate, providing little more than a snapshot of a navigation problem. *MFS* presents a four-dimensional (including time) view of navigation problems that can be manipulated for instructional purposes.

*MFS* realistically simulates many of the natural elements of flight—wind turbulence, day and nighttime flying, clear days and overcast days, and even layered cloud conditions.

Extra realism is provided by a user-controlled "realism" setting, which allows Murphy's Law to enter the flight equation. When "realism" is set high, weather conditions might deteriorate or mechanical problems develop.

While the entire simulation can be run in real time, a special facility enables the pilot to cover long distances in small time increments for cross-country flights.

### The Manual

Appropriately enough, the new version of *MFS* comes with a new manual, with pages half-again as large as traditional IBM-size documentation. This im-



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## PC ARCADE

provement makes area navigation charts and airport diagrams readable from table level. (Charts printed in the earlier documentation format were so small that the user had to squint to read them.)

The manual also contains an interesting and technically correct description of flight-control actions and the basic principles of small-airplane operation.

Just as important, the documentation contains an excellent reading list. The government books mentioned in the list are regularly used in primary flight training programs.

Part of the new documentation is devoted to the use of the *MFS* on the PCjr. (The PCjr uses the R-Y-V-N keys as the control yoke, while the PC and XT use the keyboard number pad. An overlay is provided for the PCjr keyboard.)

The new version also supports the Microsoft Mouse (to control throttle, flap, frequency selection, and toggle switches) and one or two joysticks. When one joystick is used, it controls the ailerons and elevators (roll and pitch). A second joystick can be used to control the throttle.

Microsoft has enhanced the graphics package in *MFS* so that it now supports RGB monitors (four colors in two shades) as well as composite (16 colors) and monochrome monitors. The earlier version produced only gray tones on RGB monitors.

### The MFS World

The *MFS* Version 2.0 world comprises roughly 10,000 square miles of North America. The detailed, or inhabited, world is confined to four metropolitan areas—Seattle, Los Angeles, Chicago, and Boston/New York.

The inhabited world contains 20 fully documented airports and 61 partially documented airports. Diagrams and, in some cases, approach plates are included for the fully documented airports. The partially documented airports are identified only by location (latitude and longitude) and elevation. (continued)

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CIRCLE 380 ON READER SERVICE CARD

## PC ARCADE

During part of my evaluation of *MFS*, I used a regular New York area Instrument Flight Rules chart. *MFS* accuracy—even for the partially documented airports—is truly amazing.

Roland Rees, Ziff-Davis' corporate pilot, and I "took off" in the *MFS* from La Guardia Airport and flew a round robin with touch-and-go landings at Martha's Vineyard; Windsor Locks, Connecticut; Bridgeport, Connecticut; and JFK Airport back in New York. Although the *MFS* documentation does not provide approach plates for most of these airports, we used the regular government approach plates for VOR approaches to each airport. Both the real-time navigation simulation and the airport runway layouts were perfect.

The most important aspect of the *MFS* is that it is just plain fun to use. Included

If you get tired of flying in the modern world, you can set back the clock and confront the Red Baron.

with the package is a World War I battle simulation with enemy fighters, bombing targets, and—a little ahead of its time for World War I—attack radar. So if you get tired of flying peacefully in the modern world, you can always set back the clock a few decades and confront the Red Baron.

But I've found that the peaceful world

of flying in the *Microsoft Flight Simulator* can provide hours of realistic flying fun. And I wouldn't be surprised if some *MFS* users go on to the real thing after getting a taste of Microsoft's artful program.

On *PC Magazine's* rating scale from one to six, *MFS* soars to our highest possible rating:

FUN:	6
CHALLENGE:	6
SOUND/GRAPHICS:	6
TOTAL:	18

*Dick Aarons is a senior editor at Business and Commercial Aviation Magazine. He holds a commercial pilot license and is a flight instructor with instrument and multi-engine ratings as well as an advanced and instrument ground instructor.*

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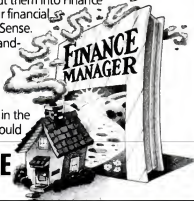
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CIRCLE 537 ON READER SERVICE CARD

# For Beginners or Old Hands: Exploring Wordstar

While one book on WordStar falls short in its attempt to execute an exciting theory, another hits its target directly, revealing WordStar's hidden capabilities to its many users.

Many users of WordStar regard this program as the worst word processor imaginable—but still better than any of the others currently on the market. Yet the complaints about WordStar have less to do with the program itself than with a lack of expert knowledge about how to make it work.

Very often the problem is not that WordStar lacks a particular capability but rather that it has too many capabilities. Beginning and intermediate users, overwhelmed by the sheer number of commands in the program, often complain about "missing" features that really are there. Even advanced users will occasionally discover a command that suddenly makes life easier. Other complaints grow out of a desire to change default settings or otherwise customize the

program. But the customization can often be done—you only have to know how to do it.

*UnderGround WordStar* can go a long way toward filling in this "missing" in-



formation. This is a highly readable, pun-filled compendium of tips for using WordStar (by Ward Starr and Mel Murch—get it?). It assumes you already feel comfortable with basic WordStar but haven't quite learned how to put the program through its paces.

The information in this 77-page booklet falls into three categories. The first contains information that is in the WordStar manual but that is usually

overlooked by beginners learning the program. Consider, for instance, the section labeled "The Lost Commands." Did you know that WordStar will let you turn off the ruler line at the top of the screen or that it will let you hide the embedded print commands for underlining, boldface, or doublestrike? If you've been using WordStar for less than a year, I'll bet you'll find at least one command here that you never learned, but one you have been wishing for.

A second category includes practical tips on the use of the nondocument mode, the benefits of keyboard enhancements, tricks for importing files from other word processors, and instructions on how to avoid disaster when you've accidentally filled your disk and can't close your file ("Back from the Jaws of Death").

The third category—more than half the booklet—includes instructions for customizing, or patching, WordStar, complete with a lengthy list titled "Important Patching Addresses."

Included with *UnderGround WordStar* is a disk with a handful of simple but useful programs on it. The one I appreciate most lets me set a color border when running WordStar on a color monitor. Without this BASIC program, the border is black, which looks horrible. This one program, plus disk, is probably worth the

**UnderGround WordStar**  
Ward Starr and Mel Murch  
Hard/Soft Press  
P.O. Box 1277  
Riverdale, NY 10471  
Copyright: 1984

Cover Price: \$14.95, plus \$2.00 for postage and handling (available by mail only; includes book and disk)

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## BOOK REVIEW

booklet's \$14.95 price tag.

If pressed, I can find some things to quibble with in *Underground WordStar*, but nothing important. There is no question that it provides a great deal of useful and highly accessible information. If you use *WordStar*, this is the booklet that deserves a spot on your reference shelf.



### *WordStar for the Working Writer*

Greg Hunt  
Banbury Books, Inc.  
353 West Lancaster Ave.  
Wayne, PA 19087  
(215) 964-8400  
Copyright: 1984  
Cover Price: \$14.95  
ISBN 0-88693-061-8

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### The Blind Leading the Blind

On the surface, the concept behind *WordStar for the Working Writer* seems sound enough: Take a nontechnical writer, let him learn *WordStar*, and have him write a tutorial to introduce other writers to *WordStar* on the IBM PC. In theory, you would expect to end up with a special perspective that would be valuable for writers. In practice, Murphy's Law takes charge, and you wind up with something very much less than what you have a right to expect.

Despite its title, *WordStar for the Working Writer* has little to do with writers and their needs. Rather it is aimed squarely at the computer neophyte who doesn't know anything about either *WordStar* or the IBM PC. Unfortunately, as Hunt freely admits, he doesn't know very much about either subject himself.

On page 158 of this 160-page book, he mentions that he has been using *WordStar* for only 6 months. One wonders whether he started before or after he signed the book contract.

Most of the information covered in the first 53 pages, in which he discusses PC-DOS and the PC itself, is already available in the more authoritative DOS manual in very readable form. When he finally gets to *WordStar*, he does nothing that hasn't been done as well or better in such well-known books as Naiman's *Introduction to WordStar* and Etlin's *WordStar Made Easy*, or even the manual for Version 3.3 of *WordStar*.

### Bad Advice

Ultimately, Hunt's unfamiliarity with *WordStar* and with computers in general sabotages any value this book might have

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## BOOK REVIEW

had. Much of his advice ranges from questionable to potentially disastrous. In describing a problem he ran into in trying to scroll through a file, Hunt suggested recovering by erasing the file, then copying it over from the backup disk. I, for one, would not erase anything until I was sure that the file on the backup disk wasn't in even worse shape.

Hunt also suggests routinely deleting backup files from your working disk to give you more space, and he then goes on

and *WordStar* along with a massive amount of handholding. I happen to be a big believer in lightening the load when dealing with technical material, but Hunt

has gone too far for my taste, and I suspect that even the most confirmed technophobe will become impatient with the overwhelming percentage of fluff. ■

This book is nothing but a very basic introduction to PC-DOS and *WordStar* with a massive amount of handholding.

to suggest that your first step in recovering from a disk-full error should be to delete your backup files. Good idea, but how can you delete what isn't there? I make a point of leaving my backup files on my working disk to guarantee that I have something to delete if I accidentally fill up a disk. This habit has helped to rescue me from innumerable disk-full problems.

I also find it remarkable that Hunt includes a section headed "I Assume You Can Type" and then discusses the IBM keyboard without even mentioning its oddball layout. I would expect that Hunt would at least mention the existence of programs like *ProKey*, which let you reprogram the keyboard to the standard IBM Selectric layout. But, of course, this assumes that Hunt is aware of such programs.

### Conclusion

Overall, this book is nothing more than a very basic introduction to PC-DOS

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### **AST-PCnet II Local Area Network**

CIRCLE 104 ON READER SERVICE CARD

# Spoon-Feeding DOS

ATI's disk-based training program, Teach Yourself PC-DOS, simulates the operating system and gets you up and running on the PC. But don't count on setting your own course.

**D**isk-based training packages are all the rage, today. The better ones can really help you learn to use your PC or a specific aspect of it, but if a program isn't imaginatively designed, you may feel like you're being spoon-fed.

*Teach Yourself PC-DOS* from American Training International (ATI) is one such training program that simulates PC-DOS in order to teach you to use the operating system. The package consists of a manual and two disks: Volume 1, *An Introduction to PC-DOS*; and Volume 2, *Advanced Training*.

Volume 1 covers the basics with three major sections: an introduction, practice using DOS commands, and practice using file commands. Volume 2 is divided into two sections, covering DOS 1.1 and DOS 2.0. Most sections contain between six and ten topics, each covering a single DOS command or logically related command such as DISKCOPY and DISKCOMP. Each topic concludes with a summary of the skills covered and offers three options: review the topic, continue training, or stop. Menus identify and offer access to each topic.

Topic selection can be idiosyncratic. Each topic is assigned a letter, and once you've typed in a letter, you can't erase it. The most convenient way I've found to correct a mistake is to press the Esc



key, leave the menu, and start over.

By experimenting, I found that it is possible to enter a string of selections. For instance, if you enter A,C,E at the File Command menu, you would see the following topics in this order: Display File Contents, Rename a File, and Erase a File. Surprisingly, this useful feature is undocumented.

In fact, the manual, in general, offers little information about using the courseware. An introduction describing its overall structure, key conventions, and features would be a helpful addition.

The 50-page manual is divided into six tabbed sections. "Check Information" describes DOS commands, such as DIR,

TYPE, and CHKDSK, for inspecting disk contents. "Revise Files" relates to commands, such as ERASE, RENAME, and EDLIN, that alter file names and contents. "Copy Information" covers formatting disks and copying files; "Troubleshooting" describes error messages; "Create Your Tree System" discusses creating and manipulating subdirectories using the MD, TREE, and CD commands; and "Monitor System" explains an assortment of commands, including RD, BACKUP, RESTORE, and FIND.

Overall, the manual contains 34 brief descriptions (each about a page long) of DOS commands and their usage. However, the limited amount of information on each command is more of a review, not a first introduction. For example, EDLIN is condensed into two pages that contain no examples. I also discovered that the two pages on batch files omit any description of specific batch commands of batch file applications.

The troubleshooting section describes 20 DOS error messages. While this is hardly a complete list, the manual does suggest remedial actions to try when you are confronted by these often cryptic diagnostics.

The program's authors haven't included any capabilities that would allow freedom of movement within a topic. Hitting

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## EDUCATION

the spacebar advances you one display at a time, and you aren't allowed to skip, browse, back up, or review within a topic. There is an option that cycles you back through an entire topic, but it is available only in the review display.

Pressing the Esc key in a topic display lets you "stop," which means, in this program, exit to a menu. Since the Esc key transports you to different displays depending on where you are when you press it, it would be helpful if the program would let you know in advance where you will land. Repeatedly pressing the Esc key returns you to DOS. Once you leave a topic via the Esc key, you cannot return to the point of departure.

The DOS commands are taught in a split-screen format, with the upper portion simulating the screen as it appears in the DOS environment, and the lower section issuing instructions and feedback. You type the DOS commands and parameters in the upper portion and respond to subsequent DOS prompts. Below, portions of the instructional display are reserved for error messages and movement options.

The program monitors your input closely, checking every keystroke and catching mistakes as you make them. If you type incorrect characters, they will not appear on the screen. For instance, if you enter DE while attempting to enter the command DIR, an error message saying "Check spelling please" will appear. If you enter DIR A:, the message "Type a : (colon) please" will appear when you type the semicolon.



### Teach Yourself PC-DOS

American Training International  
12638 Beatrice St.  
Los Angeles, CA 90066  
(213) 823-1129

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Requires: 64K RAM, one disk drive.

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The error messages are fast and silent. They appear in the lower left-hand portion of the screen, persist for little more than a second, and then fade. Moreover, when an error message is flashing, the

## The program monitors your input closely, checking every keystroke.

keyboard is frozen. Novices who constantly look down at the keys while typing may be confused when they look up and find their last few keystrokes haven't made it to the screen. I think error messages should be accompanied by a discreet but audible cue or should stay visible longer.

Input handling is thorough, unimaginative, and precise. In other words, it's an excellent characterization of and preparation for what DOS demands.

Every topic concludes with a review display that assures you, "You are doing very well." I can't understand how the courseware can render this judgment when it provides no quizzes, review exercises, or other means of measuring your performance. Furthermore, the strict input-handling techniques make it virtually impossible not to reach the end of an activity successfully.

This enforced perfection leads to another concern: the absence of remedial material or more detailed directions for the learner who knows he is not doing well despite the program's assurances. The courseware provides only minor guidance. Without identifying or otherwise reminding you of the names of the commands taught, the review display suggests: "Refer to your *ATI User's Handbook* to help you recall operations you have practiced in this training program." I believe it would be useful for the review to indicate the location of the

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information in the handbook.

*Teach Yourself PC-DOS* is a good example of the role of simulation in computer-based training. However, a weakness of this simulation is that what is not there cannot be practiced. Absent functions can only be described. Although ATI's advertising emphasizes training that requires the learner to do, not read, the learner must often read, not do.

Oftentimes the courseware's inflexible input handling becomes authoritarian, rather like a petty instructor who looks over your shoulder as you copy words from a blackboard. For example, in Volume 2 you are instructed to use EDLIN, the DOS line editor, to enter a letter—dictated line by line by the courseware—praising ATI training power. This is a fairly unimaginative, needlessly rigid exercise. ATI's authors should have permitted you to write your

**ATI's Teach Yourself PC-DOS offers a tightly focused approach to get you up and running quickly.**

own letter or to bypass the task entirely.

ATI's *Teach Yourself PC-DOS* offers a tightly focused approach aimed to get you up and running quickly. It is a useful, but hardly flawless, package; perusing IBM's own documentation while experimenting with a disk might be equally educational. If your PC applications require you to be familiar with PC-DOS, you should consider this courseware. But if you use your PC for specific tasks, such as word processing, your application software may insulate you from the complexities of DOS or from all but the most relevant features, so it wouldn't be necessary to invest time in this disk-based training package. ■

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Our pulmonary lab does 30,000 arterial blood gas (ABG) tests each year. In this test, an arterial blood sample is run through machines that check for the amount of oxygen, carbon dioxide, and acid in the blood; each test generates at least six individual numbers, so the data processing load is substantial. For several years we used a Digital Equipment minicomputer to store, report, and interpret this data, but we weren't entirely happy with it because it was big, expensive to run, and relatively inflexible.

Soon after IBM announced the PC, Dr. Lawrence Martin ordered one of the first PCs delivered in the Cleveland area. He intended it for personal use, but the possibilities for applying the PC in our lab quickly became apparent; we then badgered our hospital administration into buying a PC for the Pulmonary Division.



By April 1982, we had the PC and began to develop programs.

At first we spent a lot of programming time learning BASIC and designing a medical diagnosis teaching program. Our primary goal was to transfer our ABG programs over to the PC, but we had to wait because a hard disk wasn't available yet. We also realized that we would have to dedicate an entire computer to handling the ABG data, but we weren't in favor of the plan because we didn't want to relinquish our recently acquired, easy access to the computer. In the meantime, we recoded the DEC programs for the PC.

By the summer of 1983, we had writ-

ten programs for blood gas analysis, pleural fluid diagnosis, hospital billing, and house staff education. As we continued to find more uses for our PC, we became increasingly more reluctant about giving up the division's PC for the dedicated function of blood gas analysis. Therefore, the only solution was to obtain another PC, preferably one with a hard disk. With a little research we found we could save the hospital money by replacing the DEC with two XTs. We were also able to trade the DEC to a local company for a third XT.

Each of our four computers now has a home and an application or series of applications. We upgraded the original PC



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Media

**MEDICINE**

with double-sided, double-density disk drives. The secretary in the respiratory care section uses it to run billing and scheduling programs that serve several functions, such as keeping employee attendance records, making daily lists of all patients receiving respiratory therapy (including their room number, type of therapy, and other information), preparing billing lists, and automatically generating statistics on respiratory therapy, blood gas, and pulmonary function tests. These programs were designed so a secretary with standard typing skills and no previous computer training could easily use them.

**Blood Gas Analysis**

One XT is dedicated exclusively to blood gas analysis and operates 24 hours a day, 7 days a week. We have written comprehensive software that performs all aspects of data management, from capturing the data on-line as they are generated by the blood gas machine, to storing, reporting, and interpreting the blood gas values.

The second XT is dedicated to house staff education and sits in the intensive care unit. The ICU menu has the following options: cardiopulmonary dictionary and profile, a respiratory failure tutorial, a blood gas interpretation, a pleural fluid diagnosis, Medline (an on-line, medical bibliography), and IV dosages. With the exception of IV dosages, which prints out a medication chart based on the patient's body weight, all these programs were designed as teaching tools for house staff and medical students.

**Program Development**

The third XT is used solely for program development. We write all our own programs in BASIC and use only two commercial programs: *WordStar* and *SuperCalc*. Because we have a Wang dedicated word processor for letters and long documents, we mainly use *WordStar* to create nondocument text files incorporating our teaching programs.

*SuperCalc* is used to create administrative report charts and to tabulate pulmonary function test data. *SuperCalc* overlaps to some extent with the programs we wrote for the respiratory therapy division, particularly in graphing data generated by these programs. Although we use *WordStar* and *SuperCalc*, we prefer our own programs because of their interac-

**We prefer our own programs because of their interactive nature and ability to automatically maintain data files.**

tive nature and ability to automatically maintain data files. In addition, they don't require special training to run them.

The most often used teaching program we have written accesses Medline, an extensive on-line medical bibliography provided by the National Library of Medicine in Washington, D.C. Its archives date back to the mid-1960s and include medical articles from over 100 domestic and foreign journals. To search this huge database, you enter certain key words that are then matched against the thousands of abstracted articles.

**Easy Medline Search**

BRS/Colleague, a service allowing you to begin a Medline search in just a few minutes, was introduced last year by the Bibliographic Retrieval Service (BRS). Previously, Medline could be accessed only through more complicated retrieval systems, which were mainly available in libraries and operated by specially trained librarians. BRS/Colleague now allows physicians to easily perform a search using a modem-equipped micro and any communications program.

(continued)



We decided not to burden this ad with the usual ostentatious, self-indulgent software hype, not to dwell on the fact we've contained four accounting modules on a single diskette for total integration of the most powerful accounting package available for small business, nor to stress the sophistication, creativity, clarity and conciseness of the program's remarkably proficient reporting capabilities, nor to mention the tutorial, the queuing files, or even the fact we've put an incredible \$395 retail price on it. No, as our professional peers, we realized you'd prefer a more subtle marketing approach.

Nice Box.



## MEDICINE

We wanted to make Medline available to all our house staff through BRS/Colleague, but to keep costs down (BRS/Colleague costs \$22 per hour), re-

strict access and provide hospital users with additional information, we had to write our own communications program to access BRS/Colleague.

To avoid unauthorized or out-of-hospital use, we bury the BRS passwords and then use a protected copy of the program to prevent listing. Our program also prevents hospital personnel from accessing, even accidentally, other BRS databases that are more expensive than Medline and not germane to our medical training program. The program does not accept keystrokes ordinarily used to retrieve the other databases.

Moreover, to prevent anyone from hogging the terminal, we instituted an

To prevent anyone from hogging the terminal, we instituted an automatic cut-off time of 15 minutes.

automatic cut-off time of 15 minutes. The program gives due notice by informing you of the time limit when you sign on, and the time used up continuously appears on the screen.

### Only the Beginning

Mount Sinai's Pulmonary Division could not function at its current level of efficiency without these computers. One plan for the future is to network our micros plus any other PCs we may acquire. We also want to connect our computers to the hospital's IBM-based information system, which will be fully implemented by 1986, so our pulmonary data can be instantly available to all areas of the Medical Center. Our present situation is only the first phase of Mt. Sinai's involvement with PCs.

*Dr. Lawrence Martin is chief of the Pulmonary Division at Mount Sinai Medical Center in Cleveland. Brian Jeffreys is supervisor of the pulmonary functions laboratory there.*

## "Volkswriter® Deluxe..." the critics' choice!



“Thirty word processing programs were reviewed... no other program received a higher overall evaluation than Volkswriter Deluxe.”  
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Volkswriter Deluxe sets a new standard for transparency, simplicity, and speed. You can learn Volkswriter in under an hour... because it does so many things exactly the way you think they should be done.”

“VOLKSWRITER DELUXE is the best buy in the IBM-PC™ writing tool arena.”

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“Volkswriter Deluxe... a simple way to word processing power... for writers who like to think.”

*Washington DC Capital PC User's Group Vol. 3, #4*

“Lifetree... provides exceptionally helpful and competent assistance to registered owners, and the company's update policies are excellent.”

“In sum, this is a unique word-processing program.”

*John Lombardi, Reviewer, InfoWorld, April 16, 1984*

**We couldn't  
have said it  
better ourselves!**

Suggested Retail Price: Volkswriter Deluxe \$295 for the IBM-PC, PC compatibles, TI Professional™ and TRS-80 Model 2000.™

*“simply amazing”*



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Monterey, California 91940  
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CIRCLE 385 ON READER SERVICE CARD

# NOW YOUR PC CAN KEEP A SECRET.

## Introducing P/C Privacy: Personal/Confidential.<sup>™</sup>

Now you can keep information private more effectively and easily than ever before. P/C Privacy lets you protect spread-sheets, plans, accounting and personal records, and virtually all other types of text or data—even graphics and binary files—in about the time it takes to copy a file.

### The simply sophisticated way to lock in privacy.

P/C Privacy protects any file on your computer's disk by encrypting it using a complex algorithm. Encrypted material is read with the use of the key phrase of your choice. Without the aid of complex statistical analysis, anyone attempting to read your files without your personal decrypting code will see only indecipherable output that might look something like what you see here. Because the key can be changed each time the file is encrypted, your privacy can be protected quickly, easily, and effectively.

### Easy as learning to whisper.

P/C Privacy is so clearly documented and easy to use, you can be encrypting within minutes. Just type "ENCRYPT" and the key you've chosen—any number of characters—up to 100—and your file will be encrypted.

### Send any secret through electronic mail.

P/C Privacy is compatible with all public and private electronic mail systems. You can send and



receive private messages anywhere—even files that were previously incompatible with electronic mail. It works with virtually all software, including Lotus 1-2-3<sup>™</sup>, Multimate<sup>®</sup>, WordStar<sup>®</sup> and databases like dBase<sup>®</sup> and RBase<sup>™</sup>.

### Ultimate compatibility—another hidden advantage.

P/C Privacy is available for Apple<sup>®</sup>-DOS 3.3, CP/M<sup>®</sup>-80, and MS<sup>®</sup>/PC-DOS<sup>™</sup> including hard disk systems. A file

encrypted on any one of these operating systems can be decrypted on any other.

### To order, call 800-MCTEL84 and call on greater privacy.

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Computer Name \_\_\_\_\_  
and Model \_\_\_\_\_

Operating System  
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☐ Apple-DOS 3.3

### CIRCLE 379 ON READER SERVICE CARD

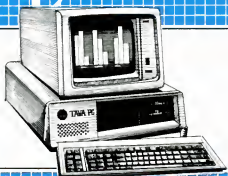
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## TAVA PC

- 2-360K Disk Drives with room for internal hard disk.
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CIRCLE 130 ON READER SERVICE CARD

# Extra Dimension Sifts the Ratings

Broadcast Management Plus' new Extra Dimension software and ratings service helps television station executives analyze the all-important program ratings quickly and easily.

**M**edia buyers and television sales executives are under attack—not by prime-time bad guys or ring around the collar, but by the ratings.

Millions of dollars worth of advertising sales and purchases depend upon studying audience measurement reports and analyzing them correctly. These studies, prepared by such companies as Arbitron Rating Co. and A.C. Nielsen Co. (NSI), are usually cumbersome to use; they are supplied either as voluminous texts or on computer tape. In the past, analysts have traditionally used either a costly third-party mainframe service to crunch the numbers or a handy calculator and instinct.

Now a new data service and software package has entered the picture to help

## PC Magazine

### Extra Dimension TV Ratings Analysis System

Broadcast Management Plus  
P.O. Box 708  
Auburn, CA 95603  
(916) 823-9060

List Price: \$540 to \$840 per month, depending on size of market.

Requires: PC-XT, color monitor, dot matrix printer.

CIRCLE 762 ON READER SERVICE CARD



broadcast market data at a glance.

BMP's product, the *Extra Dimension TV Ratings Analysis System*, runs on an IBM PC-XT with 256K RAM, a color monitor, and a dot matrix printer. The menu-driven system analyzes audiences according to station, program, and time slot. It is suited to television programming executives or sales bosses or to the advertising buyer.

### Arbitron

BMP will soon have a floppy disk available for each of the 210 local television markets surveyed by Arbitron. The markets—for which Arbitron is considered the comprehensive survey service—have so far been ignored by third-party computer vendors because of smaller station budgets. However, BMP president Roger Cooper believes that the "locals" constitute a massive media market that national, spot, and local advertisers are eager to reach.

An *Extra Dimension* subscriber will receive a new disk each time a new Arbitron report appears (from four to eight times a year). Television stations already pay Arbitron or Nielsen from \$10,000 to \$20,000 per survey for their services. Stations using the *Extra Dimension* software must pay the BMP monthly license fee, as well as a "tape access fee" to the rating service of their

advertising professionals filter survey data more quickly and efficiently. Television stations and advertising agencies can use PC-XTs to translate the demographic and viewership results into easy-to-read bar graphs within minutes.

Broadcast Management Plus (BMP), of Sacramento, California, has found a way to stuff all the statistics in a bulky Arbitron or NSI audience report onto a single 5¼-inch disk and get it to subscribers within 2 days of the report's release. The package includes the management software needed to make sense out of the report's contents and the graphics software to turn out fact sheets and graphs that illustrate the comparative

## BUSINESS

choice. BMP expects stations to sign a 3-year contract.

### New Utilities

BMP has so far created several programs in its planned series of software management utilities. One already available ranks programs on all stations in a local broadcast market during any given time period. The software delivers a neat bar graph showing television programs plotted against the number of viewers within any demographic category. Up to 120 different demographic categories are available. Subscribers can use an Epson FX-100 for a black-and-white printout.

The subscriber receives one disk loaded with the *Extra Dimension* software, one with complete local survey data, and additional disks from other markets to permit comparative analysis.

Among other BMP applications software is a market overview bar graph that ranks all local stations by "day-part" (2- or 3-hour period) rather than by individual programs. These too can be sorted in terms of chosen audiences.

A time-period comparison, on the other hand, allows the analyst to call up selected half-hour slots to see the audience ratings of particular programs. Still another option is a station profile that breaks down all the station's viewers into five age brackets and by time slot.

By the end of this year, this software will allow program directors and sales managers to compare trends in their own ratings and market shares with the historical development of their competitors. They will be able to track the performance of a program on other stations or in other markets to draw multimarket

comparisons for a given time period.

Stations will be able to calculate the cost to advertisers for every thousand persons reached and show advertisers how to get the highest yield from their dollars. The stations will be able to estimate seasonal adjustments in audience size for advance ad sales.

### Planned Applications

BMP has additional utilities up its sleeve. It will offer software for drawing up "avails and proposals," which are printed summaries of the ad time a station is offering for sale, listed according to program, audience size and characteristics, and cost per thousand viewers reached. BMP's Instant Proposal feature will tailor a proposal to an advertiser's specifications, including a weekly budget, primary and secondary demograph-

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## BUSINESS

ics, proportions of the ad budget to be allocated to specific day-parts, the maximum number of announcements available, and other restrictions.

BMP has already announced plans for enhanced *Extra Dimension* applications that will be available within the next 4 years. Sales management functions, which will include profitability analyses, revenue projections, inventory control, and appointment calendars, will be offered in 1985. Analyses of competitive media and optimal ad purchases across different media (for instance, television versus radio) are also promised. A third package, including full-time electronic monitoring of television, radio, and cable commercial activity and analysis of advertiser activity on competing stations, will probably appear between 1986 and 1988. An Arbitron manage-

ment package for radio stations is also in the works from BMP.

### BMP's MMP

Media Management Plus (MMP), an affiliated company founded 4 years ago by BMP's chairman Glenn M. DeKraker, approaches the television/advertising business from the advertiser's perspective. DeKraker developed the crucial technology to convert Arbitron and Nielsen reports from computer tape onto 5 1/4-inch floppy disks. MMP's software for the IBM PC-XT provides market surveys that are similar to BMP's analyses but directed at advertising agency personnel as opposed to television programmers. This software is capable of producing and printing a media buy order and preparing copies for the station, the client, and the advertising

agency's accounting department.

MMP software also allows ad agencies to conduct post-buy analyses comparing invoices and affidavits of the ad's performance with the original contracts.

### Pricing

BMP estimates that a subscriber to its service can purchase an XT and the other necessary hardware for under \$7,500. The full *Extra Dimension* Package #1 (sales and programming research) will be available by the end of 1984. Monthly fees will vary depending on the size of the market that the analysis is covering. At present, a subscription costs between \$540 and \$840 per month, although the price is expected to reach \$900 to \$1,400 per month when the full package of 25 applications is available at the end of the year. ■

**IBM PC 128K**  
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CIRCLE 488 ON READER SERVICE CARD



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BottomlineV makes forecasting and modeling easy because it does hundreds of complicated calculations for you. That's right, it does hundreds of calculations. If you make a change to any part of your model, it will ripple through the entire model. Automatically updating it.

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BottomlineV will tell you.

First, it will revise your income statement (P&L).

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It will even give you 24 different ratio analyses that will help you better plan and run your business.

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# On a Critical Path

Project management and scheduling in the construction industry are far easier when using a PC for critical path scheduling, a method of keeping tabs on the sequence of construction activities.

**B**uilding the World Trade Center in New York City was a logistic nightmare. Hundreds of tons of structural steel and other materials had to be delivered several times daily and hoisted into place. There was no room for stockpiling the steel, and city traffic flow had to be maintained.

To cope with these factors, the World Trade Center was first "built" on paper through the use of *critical path scheduling*, a network diagram-based method used to schedule a sequence, or multiple sequences, of activities. It allows you to calculate the dates on which each activity must start and finish in order not to delay subsequent activities of the project.

The widespread availability of PC-based scheduling programs allows previous users of critical path scheduling on minis or mainframes to realize its full potential. It also puts this powerful tool into the hands of smaller contractors who otherwise might not have the time or resources to use it.

Since its development in the 1950s, critical path method scheduling has been used for the planning and scheduling of large, complex construction projects.

Contractors of large projects rely on it for keeping track of construction activities; for preparing and approving drawings; for estimating lead times for fabrication and delivery of material and



equipment; for preparing, procuring, and awarding subcontracts; and for testing and delivering the finished project.

For a nuclear power plant, for example, many detailed design drawings are produced concurrently with construction in a process that is often called "fast tracking." This allows for construction to start on the early phases of a project, such as the foundation, before drawings are completed for later portions.

## Background

When an activity's start date can be allowed to fall behind without delaying the job or other activities, it is said to have *float* or *slack*. An activity that does not

have any float time is defined as *critical*. Through each project network, there is at least one activity path along which all activities are critical, hence the name *critical path method*.

To find out which path or paths are critical and the amount of float for each activity, the contractor must perform a series of calculations. The most popular scheduling technique in use, and the one that is synonymous with critical path scheduling, is the *activity-on-arrow* method, which consists of computing the duration of the job along each and every possible path throughout the network in a forward pass. A similar calculation in a backward pass would yield the float for

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all noncritical activities.

The calculations are tedious for projects with 25 activities or more, and you are left with only the number of days relative to the start of the project. You must convert the start and finish of each activity into a calendar date, allowing for holidays and weekends.

Another method available on some computerized scheduling programs is known as the *program evaluation and review technique (PERT)*. It is also referred to as the *precedence method of activity-on-node*. The main difference between PERT and activity-on-arrow is that PERT allows for applying probability factors to determine the duration of activities that have a high degree of uncertainty associated with them (typically, research and development projects). PERT also allows other activities to start or finish before a preceding or succeeding activity is completed or started.

### Strong Resistance

Critical path scheduling is truly an indispensable tool for construction engineers, and on microcomputers it may finally get the widespread use it deserves. However, in the past it has met with strong resistance for several reasons:

- Until recently, it was available primarily on mainframes, which put it out of reach of all but the largest firms.

- Few people understood either the theory or the concept.

- The user interface was unfriendly—information for data entry was prepared on coded sheets for keypunching, which resulted in printouts with the schedule sorted six different ways.

- The turnaround time from data entry to return of the reports was often several days, and if there were errors, the data had to be run through the computer again.

Because of the high cost and the long turnaround time, critical path scheduling was more often used to update job progress than to study alternative scenarios to improve the job schedule. Numerous construction buyers, particularly federal and state agencies, incorporated critical path scheduling as a contract requirement. The contractor was required to submit a critical path schedule at the beginning of a job for approval and to update it monthly so progress could be tracked and verified.

When the IBM PC arrived on the scene, several programs that perform critical path scheduling had begun to ap-

pear on other microcomputers.

The capabilities and output of these early programs varied greatly. Some of them computed the network and determined the early start, early finish, late start, late finish, and float for each activity relative to the start of the job. They did not, however, provide calendar dates, or even a description, identifying each activity by its start and finish identification number only. In higher price brackets more features were added, and several programs were even capable of printing out the network diagram itself.

But it wasn't until the PC was introduced that the popularity and capabilities of these scheduling programs began to grow. The combination of increased memory and RAMdisks enables the PC to handle large networks (up to 2,500 activities), and the extensive resolution of the monochrome monitor allows sophisticated screen displays of network diagrams and bar charts.

PC-based scheduling programs should help transform thousands of contractors into critical path scheduling users and believers. In an upcoming issue, we'll look at the differences between microcomputer scheduling programs and their mini and mainframe siblings. ■



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# New On The Market

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A high-speed data acquisition board for the IBM PC-XT, offering eight single-ended analog input ports with 12-bit resolution. The half-size board can accept data at rates up to 4,000 samples per second with included software. In assembly language, the software can support 30,000 samples per second.

Other features of the board's supplied software include graphics support, board calibration, linearization, a CRT-assisted Set-Up procedure, and an I/O driver that uses a single CALL statement to access all I/O functions.

The DASH-8 board also

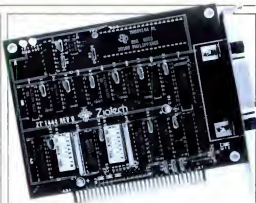
includes a precision 10-volt reference output; a programmable scan rate; foreground or background operation; 7 bits of digital I/O; interrupt handling; and event, period, pulse width, and frequency counting to 2.5 MHz.

A compatible Screw Terminal Accessory Board is available as an option, permitting external instruments and equipment with wire leads to be linked to the board easily. Also available are Expander Boards that will permit up to 128 channels of thermocouples or other types of analog inputs. (List Price: \$375)

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(617) 344-1990

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ZT 144 GPIB Controller, Ziatech Corp.

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### ZT 144 GPIB Controller

A IEEE 488 interface board for linking external scientific and engineering instruments to the IBM PC. This half-size board can accept input from as many as 15 measurement, data acquisition,

and test devices simultaneously with off-the-shelf cables, yet is small enough to fit the short slots of a PC-XT. It features fast data throughput speeds, and an electromagnetic interference (EMI) protected steel backplate that accepts stackable GPIB connectors directly.

The ZT-144 board can transfer data to or from external devices at rates up to 450 kilobytes per second, using Direct Memory Access (DMA). It is designed around a Texas Instruments' TMS9914A GPIB Controller chip, which supports all of the capabilities required by the IEEE 488-1978 specification.

Software driver packages are available from the manufacturer for BASIC, Compiled BASIC, C, FORTRAN, Pascal, and assembly languages. The BASIC package includes an interac-



DASH-8, MetraByte Corp.

## HARDWARE

tive verification program that allows the user to operate the board without writing code. For example, by answering screen prompts, the user can instruct an instrument to take a reading and display it on the CRT of the PC.

(List Price: \$375; software driver packages, \$45-\$55)  
Ziatech Corp.  
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(List Price: \$995)  
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### Hercules Color Card

A color/graphics adapter card with parallel printer port, sized to fit the short slots of an IBM PC-XT. The board is compatible with all software developed for the IBM Color/Graphics Adaptor, and can be used in a system also incorporating the Hercules Monochrome Graphics Card.  
(List Price: \$245)



Hercules Color Card, Hercules Computer Technology

### Hercules Computer Technology

2550 Ninth St.  
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Printworks controls and enhances popular printers including C. ITOH Prowriter (8510, 1550, 7500 at with the letter 'E' included in the model number).

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(Plus, Blue Plus, II, 15), OKIDATA (ML 84 Step 2, ML 92 and 93 with or without Plug'n Play Kit, Pacemaker 2350 and 2410), and STAR (Gemini 10X, 15X, Radix

10X/15X, Delta 10X/15X). For the IBM PC, PC-XT, PCjr, Compaq and many other IBM compatibles. Needs 128K and DOS 1.1 or later.

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## SOFTWARE

### SOFTWARE

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An arithmetic calculator program with memory on/off switch, printer on/off switch, and accumulation up to 999,999,999. The program also includes allowance for up to seven decimal places and an on-screen "tape" display.

(List Price: \$15.95)

**Requires:** 96K RAM, one disk drive, PC-DOS.

*ESI Software Inc.*  
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Sherwood Pk., Alberta  
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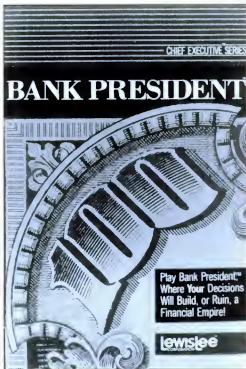
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*Bank President, Lewis & Lee Corp.*

#### Bank President

The first offering in the **CHIEF EXECUTIVE SERIES** of business management education games, designed to teach the fundamentals of business strategy and decision making. In *Bank President*, the player assumes the role of the president of a large commercial bank. Players can choose the type of bank to manage, set loan and deposit interest rates, raise or

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The game can be played at any skill level. Three dif-

ferent financial models are offered: beginner, intermediate, and advanced. Game status is preserved on disk, so a player may exit a game and later resume at the same point.

(List Price: \$74.95)

**Requires:** 64K RAM, one disk drive, PC-DOS 2.x.

*Lewis & Lee Corp.*  
1646 Portola Ave.  
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(415) 853-1220

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A French translation of the *B. Writer* word processing program. The software, designed as an introductory system, includes features such as character and line insertions/deletions, block moves and deletions, automatic line centering, right margin justification, word wrap, and an on-line help screen. *B. Writer* is also equipped with print options including underlining, emphasized print, compressed print, double-wide print, as well as a facility for chaining files together during printing.

The French version was prepared by DORTEC, a Denmark software firm. Included with the program is its BASIC source code, which permits the advanced user to alter features and customize the program to suit specific needs. A com-



piled version with better execution speed is also available.

(List Price: \$39)

**Requires:** 64K RAM (128K for compiled version), one disk drive, PC-DOS.

*Automated Information Systems*

1503 Ave. J, #203

Lubbock, TX 79401

(806) 762-6604

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### Junior Ledger

A general ledger/financial reporting program designed for small businesses. The software, written in dBASE II, is a double-entry book-keeping system with an audit trail, full editing capabilities, and error-detection routines. Reports possible under the software include check register, cash receipts register, data listing, chart of accounts listing (trial balance), distribution register, income statement, and balance sheet.

(List Price: \$195)

**Requires:** 96K RAM, two 320K drives, PC-DOS.

*Lake Avenue Software*  
77 N. Oak Knoll, #105  
Pasadena, CA 91101  
(818) 792-1881

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### filePro 16

Database management for the IBM PC-XT or PC with add-on hard disk. *filePro 16's* menu-driven facilities



Junior Ledger, Lake Avenue

allow the user to set up a filing system rapidly, search for existing records using conditional statements, and establish relations between different data files. The software can maintain up to 16 million records per file, with 999 fields per record up to a total of 4,608 characters per record. The only restriction on the number of files is available disk space.

Other facilities offered by the software include extensive error-checking, up to 12 indices per file, and selection and sorting of

records by groups of any criteria. Reporting capabilities allow custom designing of print formats and labels, which can be printed individually or in batch. Reports can contain up to four sub-totals and a grand total and can be printed with any special characters (such as graphics and copyright symbols, etc.) available from the user's printer.

Also available from the software's producers is a multi-user version of *filePro 16*, which runs under UNIX-based operating sys-

tems such as Xenix.

(List Price: \$495)

**Requires:** 256K RAM, 5-MB hard disk, PC-DOS.

*The Small Computer Co., Inc.*

230 W. 41st St.

New York, NY 10036

(212) 398-9290

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**Requires:** 128K RAM, one disk drive, PC-DOS, Summagraphics digitizer tablet.

*Geocomp Ltd.*

749 Van Gordon Ct.

Golden, CO 80401

(303) 233-1250

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(continued on page 309)

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PRINCETON MONITORS	
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215 A	\$179
300 A	\$159
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PC 10 includes 10MB Hard Disk controller, cables, mounting hardware, instructions. The PC 10 is low power, faster than the XT and can use PC DOS 2.0 or 2.1 without any modifications	\$795
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CDC 9409 5 1/4" Double Sided 40 TRK, 45 TPI	\$209

# EPSON



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RX 80FT (100 CPS, PAR-10)	\$Cali
FX 80 (160 CPS, PAR-10)	\$Cali
RX 100 (160 CPS, PAR-15)	\$Cali
FX 100 (160 CPS, PAR-15)	\$Cali
LD 1500 (w/parallel interface)	\$Cali
(200 CPS, 67 LQ)	\$Cali

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KB 5151 Deluxe Keyboard	\$239

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Austin, Texas 78727

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Austin, Texas 78746  
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13010 Research Blvd, Suite 101  
Austin, Texas 78750  
512-250-8594

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San Antonio, Texas 78238  
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Think about it a moment.

If you were to sit down and design your own integrated PC software system, what would you aim for?

Wouldn't you want to be able to integrate information from all modules in one window right on the screen? And then print it?

Wouldn't you work at it until every module gave you the functionality of the very best stand alone programs?

Wouldn't you design each module to have its own appropriate file structure?

---

### Beyond the brass ring.

---

Naturally, you'd also want it to run on a standard 256K PC.

It goes without saying that you'd want compatibility with the leading single-purpose programs.

And if you were to dream a bit, you'd go for concurrency because it would be great to do two or three jobs at the same time.

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And because we did put it all in, Enable lets you produce at levels far beyond Symphony or Framework.

Enable can integrate data from all modules in one window and then print or transmit it. For instance, you can create graphs from a spreadsheet or database. Then insert the graphs, the spreadsheet and DBMS data between text in a single word processing document *right on the screen*.

Functionality? Just as *you'd* do it, Enable's word processing, spreadsheet, database management, graphics and telecommunications are, without exception, equal to the leading stand alone business programs.

Further, Enable's files are not forced into clumsy or unsuitable structures. Enable isn't spreadsheet-based or document-based or DBMS based. Each module is designed for a specific application.

Symphony and Framework? Hardly.

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Your eyes blinked at our mention of 256K. Yet that's all you need to operate a spreadsheet with 136K of workspace. Or a word processing document whose size is limited only by available disc space. Or a DBMS file with up to 130,000,000 bytes of data.

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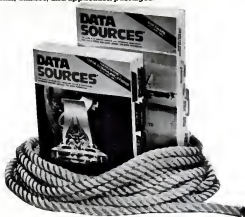
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**DATA PADLOCK**

Data encryption for restricting access to a user's files. **DATA PADLOCK** allows the user to set an eight-character password to encrypt a file, based upon the DES algorithm. The data in the file can only be subsequently called up using the same password.

The program permits encrypted files to be copied, stored, or transported safely, without losing the protective encryption.

(List Price: \$99)

**Requires:** 64K RAM, one disk drive, PC-DOS. *Glenco Engineering*  
3920 Ridge Ave.  
Arlington Hgts., IL 60004  
(312) 392-2492

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**ACCESSORIES****Portable Data Safe**

A disk safe featuring a cylinder lock and convenient carrying handle. The Portable Data Safe is molded of high-impact, glass-reinforced polyester, and can hold up to 30 5¼-inch floppy disks in a series of internal compartments.

(List Price: \$54.95)

*Bostitch Division*  
*Textron Inc.*  
800 Quaker Ln.  
E. Greenwich, RI 02818  
(401) 884-2500

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**LOCKIT**

A device that prevents unauthorized access to an IBM PC-XT by preventing boot-up until a password has been entered by the user. The device installs easily in the systems unit without requiring an expansion slot or any type of permanent modification. Access to all of the PC-XT's functions is prevented until the password is entered.

**LOCKIT** intercepts boot-up at the BIOS ROM level. A quick press of three keys can relocate the PC-XT at any time, without requiring that the system be shut off completely.

The security device works with PC-DOS 2.0 and 2.1, providing trillions

of possible password combinations. These passwords are user-selectable and can be changed at any time.

(List Price: \$129.95)

*Security Microsystems Consultants*

16 Flagg Pl., #102LF  
Staten Island, NY 10304  
(212) 667-1019  
Source Mail: STR382

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**Executive Rolltop 100**

A new version of the Rolltop 100 diskette file, capable of holding up to 120 disks vertically. The Executive model features a silver rolltop enclosure and a textured black high-impact plastic body, ten dividers, and color-coded labels. A

locking model of the file is also available.

(List Price: \$39.95; with lock, \$49.95)

*MicroComputer Accessories, Inc.*

5721 Buckingham Pkwy.  
Culver City, CA 90230  
(213) 641-1800

CIRCLE 795 ON READER  
SERVICE CARD

**HOODWINKER**

A CRT camera hood allowing users to produce 35mm color slides or prints directly from screen displays. It eliminates glare and reflections and maintains accurate focus distance from the user's monitor screen.

The **HOODWINKER** attaches directly to the lens of a standard 35mm camera. It is positioned over the screen of the user's system, permitting the display to be photographed in full room light.

Models are available for both 49mm and 52mm camera lens thread sizes, for any size display screen.

(List Price: \$49.95)

*Sector Systems Co.*  
P.O. Box 751  
Marblehead, MA 01945  
(617) 631-2878

CIRCLE 794 ON READER  
SERVICE CARD

**SafeSkin Keyboard Protector**

A precision-molded keyboard cover designed to remain in place during keyboard use. The **SafeSkin**

(continued on page 122)



Portable Data Safe, Textron Inc.

# Traditionally, databases have been left-brained.

Don't get us wrong. DayFlo is as left-brained as any database around. It can handle structured information such as customer lists and personnel records. Keywords and field names are used to gain access to records.

Just like traditional databases. However, solving traditional problems in traditional ways is just one side of DayFlo. It's also flexible enough to handle today's new challenges in exciting new ways. And that's where strictly left-brained databases get left behind. **The First Free-Form Database.**

In the real world, there's always an exception to the rule.

Which wreaks havoc on traditional databases. For example, because of fixed formats, creating a new field such as a Telex number into a single customer record is next to impossible. Unless you're prepared to reprogram

and reformat your entire database.

DayFlo, on the other hand, eliminates these tedious operations.

#### **Word-Oriented Database.**

Unlike traditional databases, DayFlo has integral word processing. For instance, you can store letters and memos along with customer lists in the same database.

Now you're free to manipulate data at will. Free to enter, retrieve, edit and shuffle information whenever and wherever you please.

Every fact you need, from key client lists to spontaneously entered notes and ideas, is just a few keystrokes away. **Power, Yes.**

#### **Programming, No.**

DayFlo is a powerful package that runs on an IBM PC with hard disk, Compaq Plus, or compatibles.

Yet, you don't have to be a programmer to use it.

So you see, DayFlo is a much greater information management tool than any traditional database.

Much more flexibility and power than pfs. Much easier to use than dBASE II.

#### **ReportFlo.**

With our ReportFlo package, you can produce presentation-quality documents, reports, letters, memos and so forth from the data stored in DayFlo. This potent report writer also performs calculations.

#### **COMPARING DAYFLO TO TRADITIONAL DATABASES**

##### **TRADITIONAL DBMS**

- Fixed record format. All records must look alike.
- No word processing capabilities.
- Fixed field length.
- Adding new fields requires remapping or reformatting of database.
- One value per field.
- Retrieves data based on pre-planned criteria only.

##### **THE BENEFITS OF DAYFLO**

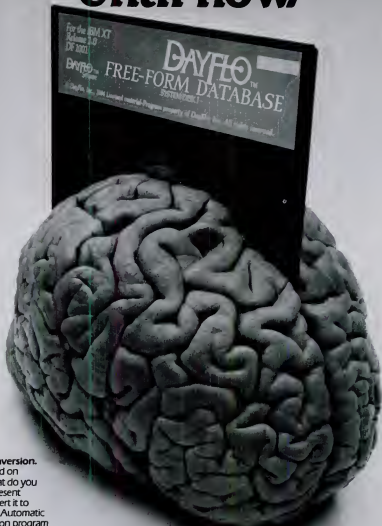
- Free-Form record format. No two records need look alike. All record formats are stored in same database.
- Integral word processing. Create and store letters, memos, notes, ideas, etc.
- Variable field length. No counting character spaces.
- Instantly add new fields to existing records without reformatting the entire database.
- Multiple values per field. Information where you want it.
- Retrieves information based on content or key words.

#### **WHAT YOU CAN DO WITH DAYFLO**

- Client Record Tracking
- Sales Lead Tracking
- Personnel Records
- Letters, Memos, Reports
- Form Letters
- Note Taking
- Purchase Order Tracking
- Project Management
- Field Service Tracking
- And much more



# Until now.



#### **Automatic Conversion.**

OK, you're sold on DayFlo. But what do you do with your present database? Convert it to DayFlo. Use our Automatic Record Conversion program for your pfs or dBASE II data. **Seeing Is Believing.**

Visit your nearest DayFlo Dealer and see DayFlo in action for yourself. Or, if you prefer, we'll send you a Demo Disk for \$10. For details, call 1-800-7DAYFLO. In California, call 1-800-CDAYFLO.

And please ask questions. Anything your brain, either side, can conjure up.

## DAYFLO™

# The right brain will love it.

DayFlo, Inc., 2500 Michelson Drive, Building 400, Irvine, CA 92715

## ACCESSORIES



*EnterCept, Integrated Applications, Inc.*

cover protects against damage to the keyboard's electronics caused by liquid spills, airborne dust, cigarette ashes, food, and other foreign matter.

SafeSkin, made of anti-static polymer, is molded to tightly hug the contours of the keyboard and is transparent, allowing keytop and side markings to remain clearly visible. Other benefits of the keyboard cover include a built-in tactile home-row and numeric character locators.

(List Price: \$29.95)

Merrill Computer Products, Inc.  
2925 LBJ Fwy., #180  
Dallas, TX 75234  
(214) 942-1142

CIRCLE 793 ON READER SERVICE CARD

### EnterCept

A security device preventing unauthorized access to data stored in a user's system. The device can be installed between a modem and the user's system to block outside access, or between the system and a terminal for security within an organization.

EnterCept provides a user-selectable six-character access code, which must be entered by the prospective system user within a 30-second time limit. Over 4.4 trillion code combinations are possible with the device.

The access combination is selected by the user inside the device's high-security case, which is provided with tamperproof locks. A local alarm is activated if an attempt is made to break open the case. Electrical contacts are included for interfacing the EnterCept unit with an external security alarm system.

(List Price: \$595)  
Integrated Applications, Inc.  
8600 Harvard Ave.  
Cleveland, OH 44105  
(216) 341-6700

CIRCLE 792 ON READER SERVICE CARD

### Printer Caddy

A solid oak printer cabinet featuring 3/4" sound absorption material, built-in dual cooling fans, and adjustable printer shelf. The cabinets are available in light, medium, and dark finishes and provide hinged doors front

and back for easy access to an enclosed printer.

Overall dimensions of the Printer Caddy are 32 by 27 by 44 inches. Four oversized ball bearings allow the unit to be moved as needed.  
(List Price: \$490)  
Daisy-Net International Inc.  
P.O. Box 1152  
Northbrook, IL 60062  
(312) 724-3800

CIRCLE 797 ON READER SERVICE CARD

### LG20 Surge Suppressor Strip

A multiple outlet strip incorporating surge suppressing circuitry. The strip features four grounded outlets, an on/off switch with pilot light, a 6-foot cord, and a push-to-reset circuit breaker.

The strip can absorb

power line surges of up to 6,000 volts or 6,500 amps, permitting only a maximum of 205 volts to pass through.

(List Price: \$34.95)

Gadgeteer  
1524 Pine St.  
Philadelphia, PA 19102  
(215) 732-0965

CIRCLE 790 ON READER SERVICE CARD

### Cable Markers

Three types of cable and cord markers for identifying wires and cables in complicated equipment installations. The markers, in sleeve, clip-on, and cable tie forms, can be applied to wires either at the time of initial installation or to lines

(continued on page 314)



LG20

Surge Suppressor Strip, Gadgeteer



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Raleigh, North Carolina 27609

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*Cable Markers, Partex Marking Systems, Ltd.*

already in place.

All of the markers can be placed without tools and are available in white or high-visibility yellow. Legends are hot-stamped for permanence.

The sleeve and clip-on styles come in four sizes and accommodate the majority of wire sizes used in the United States. The cable tie style comes in two sizes and is useful for tying together bundles of wires and cables. A wide variety of packaging is available for the low-, medium-, and high-volume user.

*(List Price: available from the manufacturer)*

**Partex Marking Systems, Ltd.**  
P.O. Box 608  
Hinsdale, IL 60521  
(312) 850-9332

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## PUBLICATIONS

### The Complete Software Marketplace

A comprehensive guide to selling new applications software in the current market. *The Complete Software Marketplace, 1984-85*, provides listings of firms buying software with the names of contacts, distributors and retailers, agents, contract specialists, venture capitalists, and marketing groups specializing in software.

The book includes case histories tracing the experiences of software authors who have successfully marketed their products, and examples of contracts, submission agreements, and copyright forms used to protect proprietary software.

*(List Price: \$17.95)*

**Warner Software/Warner Books**

666 Fifth Ave.  
New York, NY 10103  
(212) 484-2900

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## SERVICES

### Legacy Bulletin Board

The first electronic bulletin board system intended primarily for owners of the IBM PCjr. Operating 24 hours a day, 7 days a week, the Legacy Bulletin Board operates as a Hostcomm system, supporting a variety of communications parameters at 300 or 1,200 bps signal transmission rates.

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targeted for both technical and nontechnical users, as well as dealer and distribution networks. Electronic mail is also provided for users wishing to communicate with other users of the bulletin board.

Users are greeted with a listing of on-line files covering PCjr product announcements, software compatibility reports, Cartridge BASIC problems and solutions, graphics files, and general PCjr technical information. **Legacy Technologies, Ltd.**  
4817 N. 56th St.  
Lincoln, NE 68504  
(800) 228-7257  
(402) 466-8108  
(402) 466-8114 (BBS Line)

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1. Please include the retail price, distribution methods, and details of both hardware and software requirements needed for an end-user to properly use your new product. For software especially, this includes required amount of RAM, number and type of disk drives, operating system(s) supported, and any peripheral equipment needed.
2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements for the product may be included, but in most instances we need more information about a product than is typically included in an ad.
3. Include telephone contacts for marketing and technical questions.
4. If available, include black & white glossy photos of the product, 4 x 5 in. or larger.

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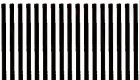
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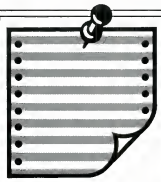
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Honolulu, HI 96815

#### Maui PC Users (MPCU)

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Kihei, Maui, HI 96753  
(808) 879-8168

#### IBM PC User Society

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Pearl City, HI 96782

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# Controlling User Input

These special input subroutines can help you establish greater control over the way users interact with the programs you write.

In BASIC the simplest way to input from the keyboard is with the INPUT or LINE INPUT commands. The instruction

```
INPUT "Date "; D$
```

for example, makes the program show the prompt "Date" followed by a question mark. The program then waits until the user signals the completion of the input by pressing the Return key. But because INPUT and LINE INPUT are general-purpose commands, they do not offer the programmer good control over the effects of user input. This makes it easy for certain user commands, intentional or not, to cause undesired results that seriously affect the program. For example:

- The cursor can be moved anywhere on the screen, not just to the proper data-entry positions, through the use of the cursor-control keys.
- Parts of the screen can be erased with the Esc key.
- The whole screen can be erased by pressing the Ctrl-Home key combination.
- The user can type in any number of characters, not just some number that is specified.
- Commas and quotation marks can produce unexpected results.

The list could go on and on, but these initial items show the need for a better way



to control input. In this article, I will demonstrate a method for handling these problems and for adding many powerful features to the input procedures of your programs. Although all the examples are written in BASIC, the methods apply equally well to any language, and translating them should be relatively easy.

Before I describe the first subroutine, you should have a clear idea of how the IBM PC handles BASIC characters. The PC internally represents every character, number, and symbol with an ASCII code number. The code for the letter A, for example, is 65; the code for B is 66, and so on. The CHR\$( ) function returns the character that corresponds to the number used as argument: PRINT CHR\$(65), for example, displays an A on the screen. The ASC function returns the ASCII code of

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## PROGRAMMING

the first character of a string: ASC("A"), for example, returns 65. Although the IBM PC can show 243 characters in the text mode, most printers and terminals can handle only 96, ranging from a space (" " or CHR\$(32)) to a little pentagon (○ or CHR\$(127)). These 96 constitute the set of "standard" ASCII characters, enhanced, in the last case, by an IBM graphic symbol.

### BASIC Input Subroutine

The input subroutine in Figure 1 removes access to almost all control characters, including those that move the cursor and clear parts (or all) of the screen. This subroutine performs three basic functions: it fetches every character pressed at the keyboard and echoes on the screen the ones it considers valid; it accepts CHR\$(8), the ASCII backspace character, to allow corrections; and it recognizes a return as an indicator of the end of an input.

In line 1020 of the program shown in Figure 1, a character is read (and placed in W\$) with the INPUT\$(1) function. Unlike the INPUT and LINE INPUT commands, INPUT\$ fetches a character as soon as a key is pressed, without waiting for a return. If W\$ is a standard character, it is

echoed on the screen (in line 1050) and added to X\$, the input buffer, where the subroutine keeps a copy of all the characters accepted in the current input. If the character is not standard (and not a backspace or return), it is totally ignored and the subroutine branches back to line 1020 to read the keyboard again.

If the character is the backspace, line 1030 first distinguishes whether X\$ is empty or not. If it's empty, then the subroutine has not accepted any character and there is nothing to erase. If X\$ is not empty, the last character of X\$ must be erased both from the screen and from X\$. The instruction

```
X$=LEFT$(X$, LEN(X$)-1)
```

takes care of the rightmost character in X\$. To erase the character from the screen, the program moves the cursor one position to the left with CHR\$(29), erases the character with a space, and prints a second CHR\$(29) to leave the cursor in the now unoccupied position. Notice that the case of the empty X\$ must be considered separately because the LEFT\$ function accepts only nonnegative arguments, and in fact LEN(X\$)-1 is negative when X\$="". CHR\$(29) is convenient because the subroutine does not need to know

### Program # 1

```
10 PRINT "Please type your name ":GOSUB 1000
20 NAM$=X$:PRINT
30 PRINT "Type your address ":GOSUB 1000
40 ADD$=X$:PRINT
50 PRINT NAM$,ADD$:END
1000 'Input subroutine
1010 X$="":LOCATE 1,1
1020 W$=INPUT$(1)
1030 IF W$=CHR$(8) THEN IF X$="" THEN 1020 ELSE
X$=LEFT$(X$, LEN(X$)-1):PRINT
CHR$(29); " ";CHR$(29);GOTO 1020
1040 IF W$=CHR$(13) THEN RETURN
1050 IF W$>=" " AND W$<="~" THEN PRINT W$;
X$=X$+W$
1060 GOTO 1020
```

Figure 1: An input subroutine program to be used in place of the INPUT and LINE INPUT commands.

## PROGRAMMING

where the cursor was when it started executing. Although the cursor moves back and forth during input, its position is known by the subroutine at all times. The

**Although the cursor moves back and forth during input, its position is known by the subroutine at all times.**

other three characters that move the cursor are CHR\$(28) to go right, CHR\$(30) to go up, and CHR\$(31) to go down.

If the character pressed is Return (CHR\$(13)), the user is signaling the end of the current input and the subroutine must return, as happens in line 1040.

On entry to the subroutine, in line 1010, X\$ is cleared, and the LOCATE command turns on the blinking cursor. If X\$ is not cleared, the second time the subroutine is called it will still contain the response to the previous input.

You can use the input subroutine of the program in Figure 1 instead of INPUT or LINE INPUT simply by executing a GOSUB 1000 command and copying X\$ into the variable chosen upon returning from the subroutine. This procedure differs from the INPUT and LINE INPUT commands in that all the cursor-control characters, including the tab, have been eliminated. In addition, Esc, the Ctrl-Home combination, Ins, and Del no longer work; quotes and commas receive no special treatment; and pressing the Return key terminates the input but does not send a line feed or carriage return to the screen.

### Default Values

I will add many convenient features to this basic subroutine, but first let me explain a feature that often comes in handy. Many applications contain certain

items that appear repeatedly and that must be retyped needlessly—for example, an invoice number that must be entered when each item on the invoice is discharged from inventory. In these cases it is convenient to create a default value, that is, a value that will be assumed if Return is pressed on an empty input field. Entering a valid character erases the default value, but it reappears when the field becomes empty again.

The input subroutine in Figure 2 expects the default value in the variable DF\$; it prints in line 1020, returns the cursor to the first position of the field, and prints the same number of CHR\$(29)s as there are characters in DF\$. The cursor could have also been moved with the command

```
PRINT STRING$(INLEN,29);
```

However, this doesn't always work. When a PRINT command attempts to send more characters to the screen than will fit in the current line (even if those characters cause a movement of the cursor), BASIC automatically adds a carriage return and a line feed and prints those characters starting at the left margin of the next line down.

When a character is erased because the backspace was pressed, the routine must deal with a new situation: if the resulting X\$ is empty, the program must branch to line 1020 (not directly to line 1030) to make the default value reappear. When a standard character is accepted in lines 1080 and 1090, it must perform the opposite action. If X\$ was empty before the entry of this new character, the default value must be erased and the cursor must return to the first position of the field.

### Program # 2

```
0  '** Input with default values **
10 DT=1984:RCT=123456!:CLS
20 PRINT"Date ";DF$=STR$(DT):GOSUB 1000
30 DT=VAL(X$):PRINT
40 PRINT"Receipt ";DF$=STR$(RCT):GOSUB 1000
50 RCT=VAL(X$):PRINT:GOTO 20
1000 'Input subroutine
1010 X$="":LOCATE ,,1
1020 PRINT DF$;FOR I=1 TO LEN(DF$):
    PRINT CHR$(29);NEXT
1030 W$=INPUT$(1)
1040 IF W$<>CHR$(8) THEN 1070
1050 IF X$=""THEN 1030 ELSE X$=LEFT$(X$,
    LEN(X$)-1):PRINT CHR$(29);" ";CHR$(29);
1060 IF X$=""THEN 1020 ELSE 1030
1070 IF W$=CHR$(13) THEN IF X$=""THEN
    X$=DF$:RETURN ELSE RETURN
1080 IF W$<" " OR W$>"~" THEN 1030
1090 IF X$=""THEN PRINT STRING$(LEN(DF$),
    " ");FOR I=1 TO LEN(DF$):
    PRINT CHR$(29);NEXT
1100 PRINT W$;X$=X$+W$;GOTO 1030 ELSE 1030
```

**Figure 2:** An expanded version of the program in Figure 1, featuring a default-value capability.

## PROGRAMMING

Pressing Return creates two new options: if X\$ is empty, the default value must be copied into X\$ before returning from the subroutine; if X\$ is not empty, the subroutine can return normally.

### A More Elaborate Input Subroutine

The variable PX\$ in Figure 3 adds a variety of functions to the input subroutine but does not include default values. The new version underlines the input field, controls the length of the input field, clears the input field with Ctrl-X, restores the contents of the last field deleted with Ctrl-R, and uses Esc to abort the input and return to the previous menu.

The variable PX\$ stores the contents of the last field erased and is cleared in line 1010. A string of underlines (as many as specified in the variable INLEN, the

length of the input field) is printed to clearly show the size of the input field, and CHR\$(29) brings the cursor back to the first position of the field.

The keyboard is read in line 1030, and the backspace is handled in line 1040. The first program used

```
CHR$(29); " "; CHR$(29)
```

to erase the last character in X\$, the third version replaces the space with an underline, restoring the prompt line after erasing a character. For convenience, I assigned these three characters to the variable ERAS\$, since it is going to be used in several parts of the subroutine; similarly, Ctrl-R\$, Ctrl-X\$, and Esc\$ are initialized in line 10 and used instead of the harder-to-read CHR\$(18), CHR\$(24), and CHR\$(27), respectively.

When the program detects Ctrl-X in

line 1050, it copies the contents of X\$ into PX\$, clears the field by printing as many ERAS\$s as there are characters in X\$, and empties X\$. Notice that to prevent the loss of PX\$ this process is not carried out if X\$ is empty. When Ctrl-R is detected in line

Every time a subroutine is called, the address of the calling line is stored in the stack.

1060, the current field is then cleared and PX\$ is copied both in X\$ and on the screen. When PX\$ is empty, Ctrl-R is ignored.

When Esc is detected in line 1070, the program clears the field and returns to the menu (line 10). Every time a subroutine is called, the address of the calling line is stored in an area of memory called the stack. Issuing the GOTO 10 command, after pressing the Esc key, returns the program to the menu. Unfortunately, the return address remains in the stack; if the input subroutine is aborted many times with Esc, the stack will ultimately run out of space and the program will fail. The RETURN 10 command does the same thing, but it also erases the return address.

When the key pressed corresponds to a standard character, line 1100 checks the length of X\$ before accepting the new W\$. If there are as many characters in X\$ as specified in INLEN, the subroutine ignores the new one and branches to line 1030 to read a new character.

The input subroutine of the third program can be further enhanced in several ways:

- The prompt line can also be made with periods or with any other character that does not visually conflict with the text entered.
- To surround the input field with brackets, simply change line 1020 to

#### Program # 3

```
10 CLS:ERAS$=CHR$(29)+""+CHR$(29):CTRL_R$=CHR$(18):
   CTRL_X$=CHR$(24):ESC$=CHR$(27)
20 PRINT:PRINT "1-Name":PRINT "2-Address":PRINT "3-End ":
30 W$=INPUT$(1):IF W$="1"OR W$="3"THEN 30 ELSE PRINT
40 ON VAL(W$) GOTO 50,70,90
50 PRINT>Type your name "":INLEN=22:GOSUB 1000
60 NAME$=X$:PRINT:GOTO 20
70 PRINT>Type your address "":INLEN=30:GOSUB 1000
80 ADDR$=X$:PRINT:GOTO 20
90 PRINT NAME$,ADDR$:END
1000 "Input subroutine
1010 X$="":PX$="":LOCATE ,1
1020 PRINT STRING$(INLEN, " "):FOR I=1 TO INLEN:
   PRINT CHR$(29):NEXT
1030 W$=INPUT$(1)
1040 IF W$=CHR$(8) THEN IF X$="" THEN 1030 ELSE
   X$=LEFT$(X$,LEN(X$)-1):PRINT ERAS$:GOTO 1030
1050 IF W$=CTRL_X$ THEN IF X$="" THEN 1030 ELSE
   PX$=X$:FOR I=1 TO LEN(X$):PRINT ERAS$:NEXT:
   X$="":GOTO 1030
1060 IF W$=CTRL_R$ THEN IF PX$="" THEN 1030 ELSE
   FOR I=1 TO LEN(X$):PRINT ERAS$:NEXT:X$=PX$:
   PRINT X$:GOTO 1030
1070 IF W$=ESC$ THEN FOR I=1 TO LEN(X$):PRINT ERAS$:
   NEXT:RETURN 20
1080 IF W$=CHR$(13) THEN FOR I=1 TO INLEN-LEN(X$):
   PRINT " ":NEXT:RETURN
1090 IF W$=" "OR W$="" THEN 1030
1100 IF LEN(X$)=INLEN THEN 1030 ELSE PRINT W$:
   X$=X$W$:GOTO 1030
```

Figure 3: Another expanded version of the program in Figure 1, this time including features such as underlining, clearing, and controlling the length of the input field.



## PROGRAMMING

```
1020 PRINT"[";STRING$(INLEN,"_");"]";:  
FOR I=1 TO INLEN+1:  
PRINT CHR$(29);:NEXT
```

You can also choose other delimiting characters, including graphics.

• Line 1010 clears PX\$ to prevent the restoration of a previous field that might conflict with the size or type of a new input. However, PX\$ can be saved in a third variable to allow its restoration with a special key, facilitating the reproduction and transportation of data from one field to another.

• When there is more than one menu, a variable can be used to indicate the point of return for an input aborted with Esc. Supposing there are three menus (starting in lines 20, 100, and 500) and the variable GUIDE is used to indicate the last menu displayed, the changes to the input subroutine would be

```
1070 IF W$< >ESC$ THEN 1080  
ELSE FOR I=1 TO LEN(X$):  
PRINT ERA$;:  
NEXT:ON GUIDE GOTO  
1071,1072,1073  
1071 RETURN 20  
1072 RETURN 100  
1073 RETURN 500
```

• There are certain cases in which the input can be considered terminated when the specified length is reached. Examples of this are the months of the year, in which three letters are enough to produce an unambiguous answer, and Yes or No questions, where a single letter, Y or N, suffices. To place this automatic return in the input subroutine, change line 1100 to:

```
1100 X$=X$+W$:PRINT W$;  
:IF LEN(X$)=INLEN  
THEN RETURN ELSE 1030
```

As helpful as these routines may be, they are not the limit. A more sophisticated input subroutine could include nondestructive cursor movements to the left and right, as well as inserts and deletes in the middle of the field. The ultimate would be a full-screen input editor. ■

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EDITED BY PAUL SOMERSON

# User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.

The following letters all contain hints and tips about 1-2-3. PC thanks 1-2-3 expert David Hoffman for his help in evaluating these letters. Hoffman is president of Abacus Productions, Inc., a New York City

print quality in exchange for greater speed of operation through the use of GRAPHICS.COM from DOS 2.0. Unfortunately, when I tried it, all I got was gibberish on the printer.

I didn't want to tackle dissecting 1-2-3 to try to find out why the graphs wouldn't print, but I had no qualms about looking at the DOS GRAPHICS.COM.

It turns out that when 1-2-3 finishes displaying a graph on the color monitor, the computer itself is not in Graphics mode, but rather in mode 2 or 3. When GRAPHICS.COM is run, it checks to see if the PC is in Graphics mode 4, 5, or 6. If so, it does a graphics printout. Otherwise, it uses the standard PrtSc facility of 80 columns and 25 lines.

My solution was to put a special copy of GRAPHICS.COM on my 1-2-3 system disk (see Figure 1) and to patch it so that it always does a graphics printout, regardless of the mode of the PC. The program is small (789 bytes), so there is plenty of room for it on the system disk. I was already using an AUTOEXEC file to set my system clock, so I added GRAPHICS.COM to it.

Now when I'm running a series of 1-2-3 graphs, the Shift-PrtSc command immediately prints the hard copy.

P.M. Chamberlain  
Dallas, Texas

(continued)



firm that provides production and consulting services to the motion picture industry. The comments that follow each letter are his.

Next issue we'll resume covering the usual non-1-2-3 topics.

## DOS Patch

Although the Lotus 1-2-3 facility for printing hard copies of graphs works very well, it does require creating a file, changing diskettes, and going through the Print-graph program.

I was willing to accept somewhat lower

## USER-TO-USER

*The patch is a good idea, and the DEBUG procedure seems sound, but out of a dozen or so tests using the trick—on several printers—it worked only once. Perhaps some assembly language expert reading this can figure out exactly why.*

### Leap Years

A note of warning to 1-2-3 users who use the full range of date serial numbers:

As all calendar trivia enthusiasts know, and as the *American Heritage Dictionary of the English Language* puts it, "every year whose number is [evenly] divisible by 4 is a leap year, with the exception of centennial [evenly divisible by 100] numbers, which are leap years only when [evenly] divisible by 400." This means that the year 1900 was not a leap year, while the year 2000 will be one.

Lotus' 1-2-3 (Version 1A) has the leap year status of these two centennial years backwards. To see for yourself, go to an empty area of your worksheet and enter the commands in Figure 2. If all the dates you deal with are between 3/01/1900 and 2/28/2000, you won't have any difficulty, although the serial numbers will all be one greater than they really should be. But

beware if you use subtraction to find the number of days between two date serial numbers, one within and the other outside this range!

Rex Swain  
New York, New York

### Fascinating.

#### Bugs?

Here are some of the bugs I recently came across in 1-2-3, and I would love to hear remedies for them.

#### Bug Number 1:

Start with an empty worksheet. Go to cell B4 (or wherever) and type /RU to unprotect this cell. Go to cell C4 and type +B4\*2. Return to cell B4 and type 2. Cell C4 displays 4.

Now issue the command /WGRM to set the recalculation to manual.

Define the range A1..E10 with the /RNC and give it the name "test."

Finally, issue the /Rtest~ command.

The pointer goes into cell B4.

Type 4.

Cell B4 will display 4, cell C4 still displays 4. This is expected, but:

```
A>debug_graphics.com
~d 123 124
XXXXX123 3C 04      (Quit if results right of the colon don't match)
~e 123
XXXXX123 3C EB      <spacebar> 04.14
~w
Writing 0315 bytes
~g
```

Figure 1: Procedure for modifying GRAPHICS.COM; type everything underlined.

59 {DOWN}	60 {DOWN}	61 {DOWN}	36584 {DOWN}	36585
{K1GHT}	{WCS13~}	+A5~	/C~B1.B4~/	RFD1{END}{UP}~
Serial	Formatted			
59	28-Feb-00			
60	29-Feb-00			
61	01-Mar-00			
36584	28-Feb-2000			
36585	01-Mar-2000			

Figure 2: A program demonstrating that 1-2-3 has reversed the leap year status of the years 1900 and 2000.

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## USER-TO-USER

• Note that the Calc indicator did not light up as it should have, since this is your only warning that the worksheet is not updated when you use the manual recalculation mode.

• Try to update the worksheet with the F9 (Calc) key; 1-2-3 will beep at you.

This bug is annoying since the whole purpose of "range input" is to design forms for users, and it is specifically suggested in the manual that the only keys that

Unfortunately,  
1-2-3 does not  
allow copying from  
one subdirectory  
to another.

are active during the Range Input command are F1, F2, and F9. Clearly this is a bug. The solution (although not elegant) is to place the CALC command right after the range input in the macro, so that when the user gets out of the range input, the worksheet is recalculated. The user then loses the benefit of seeing the results of the input. A second pass through the worksheet allows the user to see this result, but then he has to wait for another recalculation when he gets out.

## Bug Number 2:

Try printing triple density (high quality) on the Epson MX-80. It works fine if you print one graph at a time, but if you want to batch process 12 graphs during a night (a necessary procedure since printing takes about an hour per graphic), a horrible bug creeps in! The GRAPH program counts only 65 lines per page (instead of 66), and the graphs are progressively shifted to the right side of the graph (or the top of the page) until they overlap the perforation. Be aware of this, because you may be tempted to print a series of graphs that you need in a rush for the next day. Trying to fool the computer into believing that the MX-80 is an FX-80 won't work, and trying to redefine the page length won't work

either. Although I do not have an IBM graphics printer, it is conceivable that the same bug could affect this printer too.

## Bug Number 3:

After producing 194 graphs, I tried to batch process them during the night. Bad luck! 1-2-3 is not prepared to deal with many graphs and refuses to display them for your selection when you want to start the printing program. 1-2-3 initiates the selection process, then returns to you without displaying the usual Graph menu. There is no error message that appears, and you are left to wonder if all your work has been zapped! If you go into the File Manager program, there won't be any problem to display those graphs. The solution, which is very cumbersome, is to get rid of some of the graphs by temporarily placing them into a second subdirectory. It would be nice to be able to use File Manager to do this by marking the appropriate files and then copying them onto another subdirectory. Unfortunately, 1-2-3 does not allow you to copy from one subdirectory into another, probably a hangover of the pre-hard disk period.

The only solution is to exit to DOS and copy (with wildcard) related graph files to a second subdirectory. This is slow and memory consuming since you need to temporarily store your files twice. After transferring the picture files to the second subdirectory, you have to delete them from the original subdirectory, a very hazardous procedure! Note that this can be done with the File Manager program, and it can be speeded up if you first sort the directory by date/time as the "primary key" and by the extension as the "secondary key." Both should be sorted in descending order. Try to keep a directory printout to be sure to erase only what is necessary. When you have reduced the number of graph files to less than 100, return to Printgraph, and print a first batch of graphs. When done, move the graph that you just printed to a third subdirectory, and with the COPY \*.PIC command, transfer the temporarily exiled files into the first subdirectory. (continued)

## USER-TO-USER

### Some Miscellaneous Tips

Here is a simple solution for a problem that may have annoyed some of you. When you have a large application, with dozens of range names, there is no procedure in 1-2-3 to list what each range covers or to determine if a specific cell already has a range name. Although there are dedicated programs to tell you that, the poor man's solution to these problems are:

1. To find what is covered by a range name, try the /RNC command and reslect the same name. When the range appears highlighted, pressing the period (.) key will allow you to turn around the four corners, and thus see what is covered. Using the GoTo key (F5) would not have helped, since it would have led you to the upper left corner, but without showing the range.

2. To find if a cell has a range name, go into a neighboring cell and type: +(cell address), where the cell address is the cell you want to investigate. After hitting the Enter key, the formula will appear on the first line of the command panel, and if the cell has a name, it will replace the cell address. Unfortunately this trick does not work with ranges that span more than one cell.

Finally, does anyone have a patch to switch the highlighted border with the cell address from reverse video to regular display?

Philippe Jeanty, M.D.  
Yale University School of Medicine  
New Haven, Connecticut

*The claims in Bug Number 1 are accurate, though they may not bother many people. Range Input is used mainly for simple forms entry where the input speed gained by using /WGRM is not that important. IRI is fragile at best, and it appears that the concept will be significantly reworked in Symphony.*

*As for Bug Number 2, trying to print triple-density to an MX-80 caused problems much more severe than bad pagination. Lotus representatives said they had heard reports of funny things happening in*

*triple-density mode but requested a copy of my PrintGraph disk before they would try to analyze the situation.*

*I did not experience any problem displaying or marking over 100 picture files, nor returning to the PrintGraph menu, as*

**Readers: Does anyone have a patch that can switch the highlighted border with the cell address from reverse video to regular display?**

*mentioned in Bug Number 3. An alternative to copying all those files into another subdirectory would be to use the RE-NAME command. For instance, the DOS statement REN\# S\*.PIC\# \*.TMP would take any picture file beginning with S and change its extension from .PIC to .TMP. This procedure is faster and less cumbersome than the one described.*

*The tips mentioned at the end are useful, especially the first. Using /RNC to remind yourself of the dimensions of a range, while jumping to each of the four corners with the period, is a very helpful technique. This feature of the dot key is documented in the Range section of the Basic Skills chapter of the 1-2-3 manual. The answer to the final query is Lotus' Symphony.*

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## MARK ZACHMANN

# PC Tutor

### GET-Happy Animation

**Q:** I have been trying to do smooth animation on the PC. I'm not satisfied with the results of drawing one view, erasing the screen, then drawing another rotated or



translated view. This is far too slow, and transitions are hardly smooth because of the successive screen clearings. BLOADing is also too slow.

The only method coming close to the speed and smoothness I want is to create a number of graphics frames that are invisible until their arrays are PUT to the screen in rapid succession. However, the problem with this method is that I quickly run out of memory after writing DIM statements to define the many large arrays that hold these frames.

When I animate a figure with GET and PUT, I can obtain speed, but only at the cost of coordinate information, which I assume I need to rotate or translate an image. Is there a way I can derive coordinate information from the data in a GET array, then run those coordinates through a translation or rotation algorithm?

In its discussion on GET, IBM's BASIC manual explains how to examine the GET array. Unfortunately, this explanation isn't written in a dialect of English I can comprehend. I've looked at GET arrays, but I can't make heads nor tails of

all those large numbers—not even to tell which numbers represent the *x* and *y* dimensions.

If those numbers actually represent coordinate information, how can they be used for rotating, translating, and scaling an image?

Randolph R. Madera  
Forest Park, Illinois

**A:** Consider the PC's screen—or any image on it—to be a collection of dots, called picture elements, pixels, or pels. When you perform a GET statement, it takes a bit image off the screen and stores it as an array with a value for each pixel, which represents its color.

Pixel information is handled differently in the PC's two graphics modes. In High-Resolution mode (640×200 pixels), each pixel can be either black or white. Therefore, each pixel can be defined by 1 bit, and a byte can store information on 8 pixels. In Medium-Resolution mode (320×200 pixels), there's a choice of four colors from whichever color pallet is active. Since 2 bits are needed to specify these four possible colors, only 4 pixels can be defined in 1 byte. (As a general rule, *n* bits can define up to 2<sup>*n*</sup> different colors.)

For a specific case, see the graphics image created and manipulated by the program in Figure 1. Lines 1000 to 1140 define a four-color rectangular image on a medium-resolution screen. The rectangle is formed by 31 screen lines, each 131 pixels across. At first glance, you might think a GET array could define the 4,061 pixels in that area (31×131) in exactly twice that number of bits—8,122—or about 1,016 bytes.

It's not so simple, however, because the 31×131 dimensions of this image work out less neatly than the example in IBM's BASIC manual, which involves a 10-by-12-pixel image. The 131 pixels in each row could be defined in 32.75 bytes;

# PC TUTOR

```

100 ANIMATE.BAS for PC Tutor, Volume 3 Issue 19
110
120 INITIALIZE
130
140 CLS : KEY OFF : SCREEN 1
150 ADRS% = 0 : M1% = 0 : M2% = 0 : I% = 0 : J% = 0
160
1800 'DRAW AND PAINT BOX IMAGE
1810
1820 LINE (20,20)-(150,20),1
1830 LINE (150,20)-(150,50),1
1840 LINE (150,50)-(20,50),1
1850 LINE (20,50)-(20,20),1
1860 LINE (85,35)-(20,20),1
1870 LINE (85,35)-(150,20),1
1880 LINE (85,35)-(150,50),1
1890 LINE (85,35)-(20,50),1
1100 PAINT (21,21),3,1
1110 PAINT (30,21),2,1
1120 PAINT (140,40),1,1
1130 PAINT (85,49),0,1
1140
2000 'LOAD IMAGE INTO ARRAY
2010
2020 DIM NUMS%(1027)
2030 GET (20,20)-(150,50),NUMS%
2040
3000 'INVERT IMAGE & TIMES
3010
3020 FOR TX = 1 TO 6
3030 ADRS% = VARPTR(NUMS%(0))
3040 ADRS% = ADRS% + 4
3050 FOR IX = 0 TO 14
3060 FOR JX = 0 TO 32
3070 M1% = PEEK(ADRS% + JX + IX * 33)
3080 M2% = PEEK(ADRS% + JX + (30 - IX) * 33)
3090 POKE ADRS% + JX + IX * 33, M2%
3100 POKE ADRS% + JX + (30 - IX) * 33, M1%
3110 NEXT JX
3120 NEXT IX
3130 CLS
3140 PUT (20,20),NUMS%
3150 NEXT TX
3160
5000 'READ IMAGE INTO AN ASCII MEMORY MAP (FILE=MEM-MAP.TXT)
5010
5020 AX = 3 : FX = 0 : X% = 4 : P1$ = "" : P2$ = "" : P3$ = "" : P4$ = ""
5030 OPEN "O", #1, "MEM-MAP.TXT"
5040
5050 FOR AX = 4 TO 1027
5060 FX = PEEK(VARPTR(NUMS%(0))) + AX
5070 P1$ = MID$(STR$(INT(FX/64)), 2, 1)
5080 P2$ = MID$(STR$(INT((FX AND 6350)/16)), 2, 1)
5090 P3$ = MID$(STR$(INT((FX AND 6300)/4)), 2, 1)
5100 P4$ = MID$(STR$(INT((FX AND 3))), 2, 1)
5110 IF XX = 35 THEN W4$ = "" : 'NULL CHARACTER ENDS EACH LINE
5120 PRINT #1, P1$; P2$; P3$; P4$;
5130 IF XX = 36 THEN XX = 0 : PRINT #1, "" ELSE XX = XX + 1
5140 NEXT AX
5150 CLOSE
5160
5170 END

```

**Figure 1:** A BASIC program in which GET and PUT statements manipulate a graphics screen image (lines 2000 to 3160) and the image is stored in a file, where the color of each pixel is mapped as a number from 0 to 3 (lines 5000 to 5160).

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## PC TUTOR

*BASIC requires that you use only full-byte amounts, so you must round this up to 33 bytes. Since there are 31 rows, the data for the image occupies 1,023 bytes.*

In addition, GET uses 4 bytes at the beginning of each array to define the dimensions of the image. The first 2-byte integer tells the number of pixels across; the next 2 bytes tell the number of screen lines down. To sum it up, the array for this 31x131 image requires 1,027 bytes, which is the value 1 used in line 2020 to initialize the GET array.

Now that GET has captured the image in an array, you can quickly draw it in a new location by writing a PUT statement with a different coordinate, such as:

**PUT (80,100),NUMS%**

It isn't very difficult to flip the image top to bottom, such as is done in lines 3000 to 3160. Line 3030 points to the beginning of the array. Line 3040 skips over the 4 bytes of coordinate information. The loop beginning in line 3050 swaps each line on the screen with its counterpart line at the same distance up from the bottom of the image. (Only 15 repetitions are needed to exchange these 31 lines, since the center line can remain unchanged.) The inner loop, which begins in line 3060, swaps the information between the pairs of lines, byte by byte—or in other words, 4 pixels at a time.

When the inverted NUMS% array is complete, line 3140 PUTs it on the screen in place of the original image. In Figure 1, this process is repeated six times; the original image is restored every other time. With interpreted BASIC, it takes about 12 seconds for the image to change each time; however, when this program is compiled, each new image appears in less than half a second—fast enough to be practical for animation.

It's far more complicated to transpose an image from right to left by processing it as an array. You can't simply swap bytes from one end of the line to the other because each byte defines 4 pixels in a particular order. In a routine equivalent

to lines 3060 to 3110; you'd have to use the following process, which pulls out each pair of bits from a byte (A% here) and assembles the four pairs in the reverse order in another byte (called B%):

**B% = (A% AND 3) \* 64**

**B% = B% + (A% AND &hC) \* 4**

**B% = B% + (A% AND &h30) / 4**

**B% = B% + A% / 64**

This process could also be used in a routine that doubles the scale of an image. Scaling to any other size or rotating at irregular angles are probably too difficult to do with GET and PUT routines.

You mentioned that the numbers you found when examining a GET array confused you because they seemed far too large. Remember, each byte in the array defines which of four colors is used on each of four pixels. Two bits are devoted to each pixel; the pair stores a value between 0 and 3, but the aggregate value in the whole byte could range between 0 and 255. After running line 5060 in Figure 1, if 1, 3, 0, and 2 were the color values for the 4 pixels defined by byte F%, running this additional program line

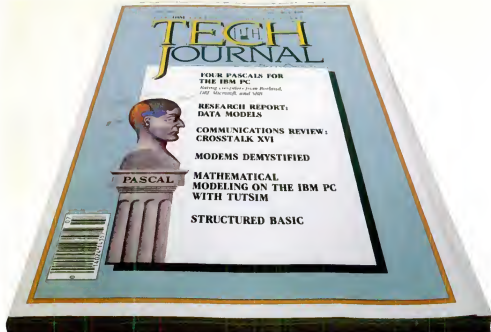
**5065 PRINT F%**

would display 114, the decimal value of 0110010.

There's a more straightforward way to examine this GET array than to read it byte by byte. The routine beginning at line 5000 extracts the four 2-bit integers from each byte and stores these numbers in a file called MEM-MAP.TXT. You can use a 132-column printer or Compressed Text mode to print out this file as a map with a digit from 0 to 3 at each pixel's position to represent its pallet color. This output can be treated as a color-by-number version of the image. ■

The PC Tutor solves practical problems and explains points of general interest. If you'd like to see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.





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# Getting the Most Out of Wordstar

Like all software, WordStar has its quirks and limitations. But the user who's wise to Wordstar tricks can find a way around the shortcomings and push the program to the limit.

**M**icroPro's *WordStar* has some strong ideas about what it can and cannot do. But as *WordStar* aficionados know, it's possible to trick the word processor into performing operations it doesn't even know it can handle. We looked at a few tricks in the last issue ("Making WordStar Uncommonly Good," *PC*, Volume 3 Number 18). Here are more sneaky techniques.

## MailMerge Postscripts

Can you write variable postscripts into *MailMerge*? Not officially, primarily because of *MailMerge*'s field-length limit of 200 characters or about three text lines. You could insert several three-line postscripts in succession, but that's a bit cumbersome. Instead, you can create a bunch of postscripts with *WordStar* and then tell *MailMerge* to ask, as you print each letter, which one to insert. As an example, let's program a variable postscript that calls for a further variable insertion: the name and phone number of a sales rep in the addressee's area.

First, name a new file PS and create the postscript you need. For example:

P.S. By the way, there's a Cashpenny Systems representative in your area. Though the literature we've enclosed will tell you much about our line, we urge you to ask for



a hands-on Cashpenny System demonstration. Your dealer is:  
.fi DEALER

At the start of your *MailMerge* letter, include a "display message" dot command:

```
.op
.mt0
.df DATAFILENAME
.RV NAME.ADDR1,
ADDR2.PERSON
.DM Next letter is to:
&ADDR2&
```

The .DM command displays data from the next letter to be printed so that you

can choose a postscript, if any, and adjust the paper in the printer accordingly. You'll have to look at the data file to find out who gets the very first letter.

At the end of the letter, insert the following dot commands:

```
.av "If a P.S. is re-
quired, enter PS; if not,
hit RET:", PS
.fi &PS&
.pa
```

The first command means, "Ask for a variable to be labeled PS." The second means, "Insert the file named whatever we named it above." In this case, in response to our on-screen prompt, we named it PS. If you do want to include a postscript, hit PS and then the Enter key. *MailMerge* will pull into the letter the PS file you created previously.

If you don't want to include a postscript, hit the Enter key. The screen will display two weird error messages:

```
*** File B:F Not Found
*** Invalid Dot Command
Ignored:
.fi
```

You're fooling *MailMerge* into doing something new, and the error messages express its resistance to commands from a more active intelligence.

Postscript files and other inserted files

## WRITING

must end with a hard carriage return. Hit the Enter key at the end of the last file line and make sure there are no spaces in that line except the space in column 1. To remove any extra spaces, put the cursor in column 1 and type Ctrl-QY.

What you're going to do now is known as "file nesting." You can nest up to eight inserted files. The file insert command at the end of the postscript—fi DEALER—brings in this file, named DEALER

```
.av 'Enter LA, NY, CHI,  
SF, or DAL:', NAME  
.fi &NAME&
```

where LA, NY, CHI, and so on are files containing the names and addresses of representatives from those cities. You'll now be prompted to enter the city abbreviation. Here's the file for DAL:

```
Sam Adams  
Cashpenny Accounting  
Systems  
500 W. Coconut  
Dallas, TX 77983  
(204) 987-2321
```

The files for LA, NY, CHI, and SF contain corresponding data for the dealers in those cities.

To select from a batch of postscripts without further nesting, all you need do is change the original dot command lines to the following:

```
.av 'If no PS hit RET; or  
enter LA, NY, CHI, SF, or  
DAL:', PS  
.fi &PS&  
.pa
```

Save the changed letter and then edit each of the "city" files. Read in the PS file so that each city file becomes a self-contained postscript.

You can nest your product line in 50 separate files, if you like, and nest an entire dealer network below them. The only limit to this technique is your disk capacity.

### Column Moves Made Easy

*WordStar's* useful column-move function can be tricky. A factor that complicates column moves is the on-screen presence of control characters for special features such as boldface, underlining,

## WordStar's column-move function can be tricky because of on-screen control characters.

and doublestrike. These characters make it hard to visualize the final printed result. By typing Ctrl-OD, you can temporarily remove the control codes from the screen display.

Print control codes must be entered differently from those entered in normal block-mode text. In Column mode, you must enter right and left control codes for boldface or underlining in each column. If you type

```
(Ctrl-PB) Phone List for  
John Smith Ext. 555  
Ace Computing Co. (Ctrl-  
PB) Mary Smythe Ext. 666
```

you'll get a boldface John Smith listing. Instead, enter

```
(Ctrl-PB) Phone List for  
(Ctrl-PB) John Smith Ext.  
555  
(Ctrl-PB) Ace Computing  
Co. (Ctrl-PB) Mary Smythe  
Ext. 666
```

To format a three-column phone number list on a single page, first type the list in a three-page column. Hit Ctrl-KN to turn on Column mode. Go to page 2, line 1, column 1 and type Ctrl-KB to start your column block. Type Ctrl-QC to go to the end of the file. Take the cursor outside the right edge of the column and type Ctrl-KK. Only the block is highlighted (or marked off with B's and K's if you

don't have highlighting).

Now type Ctrl-QR to return to the start of the file. Hit Ctrl-OD to turn off display characters. Maneuver the cursor into position for your column move to line 1, column 1 of the proposed second column. Type QV, and wait; column moves take longer than block moves.

Now you've got a very long column 2. Move down inside the column to the point at which you want to detach column 3, and type Ctrl-KB. Go back to the proposed first square of column 3, do another Ctrl-QV, and you've got a three-column formatted list.

To format a very long list, bite off a little at a time. By the way, it's advisable to copy your material into a temporary work file before formatting it with column moves. Should you botch it up, it's much quicker to abandon the file and start all over than to turn a columnized table back into a one-column list.

Moving text in column blocks quickly leaves you with a gaping, growing chasm to leap across every time you go "downfile" to fetch more material. To remove these spaces, first type Ctrl-KN to leave Column mode. Then mark the beginning of the space with Ctrl-KB, move to the first letter of the continuing text, type Ctrl-KK to end the block, and hit Ctrl-KY to remove the space.

### Managing the Slippery Ellipsis

If you use ellipses, you know that the three dots, when word-wrapped or paragraph-reformatted, can play havoc with your printouts if they end up in column 1. As you know, *WordStar* interprets a dot in column 1 as a special formatting command. A line with two dots in column 1 is a comment and will not print.

The solution is to create ellipses with "non-break" spaces. Place a Ctrl-PO at every space between the words separated by the ellipsis. This technique also works to keep dates, fractions, and other elements from being split between lines.

Now, can someone tell us how to make *WordStar* do multiple windows? ■

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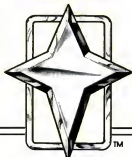
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